FIGURE 37.1 A typical truck frame is an excellent example of a ladder-type frame. The two side members are connected by a crossmembers.

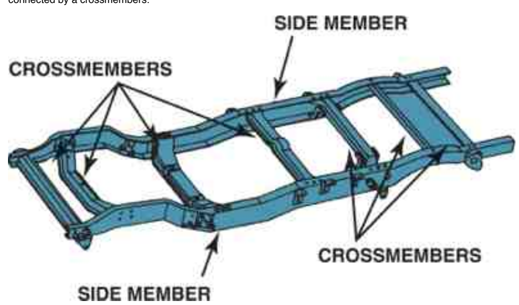

FIGURE 37.2 (a) Separate body and frame construction; (b) Unitized construction: The small frame members are for support of the engine and suspension components. Many vehicles attach the suspension components directly to the reinforced sections of the body and do not require the rear frame section.

FIGURE 37.3 Welded metal sections create a platform that combines the body with the frame using unit-body construction.

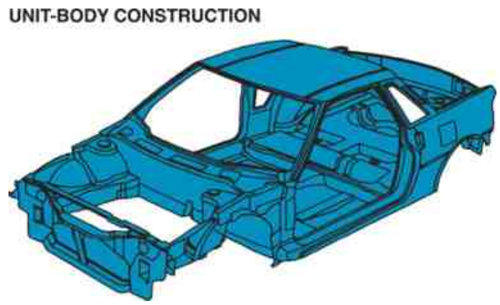

FIGURE 37.4 Most early vehicles used single straight axles.

FIGURE 37.5 An independent suspension means that if one wheel hits a bump, only that wheel moves upward and allows the opposite wheel to remain unaffected by the bump. This type of suspension allows for smoother ride and is used in most front suspensions and many rear suspensions.

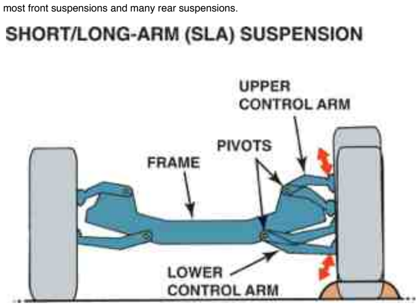

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FIGURE 37.6 The spring rate of a coil spring is determined by the diameter of the spring and the diameter of the steel used in its construction plus the number of coils and the free length (height).

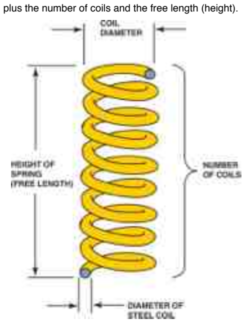

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FIGURE 37.7 When a leaf spring is compressed, the spring flattens and becomes longer. The shackles allow for this lengthening. Rubber bushings are used in the ends of the spring and shackles are used to help isolate road noise from traveling into the passenger compartment.

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FIGURE 37.8 A torsion bar resists twisting and is used as a spring on some cars and many four-wheel-drive pickup trucks and sport utility vehicles.

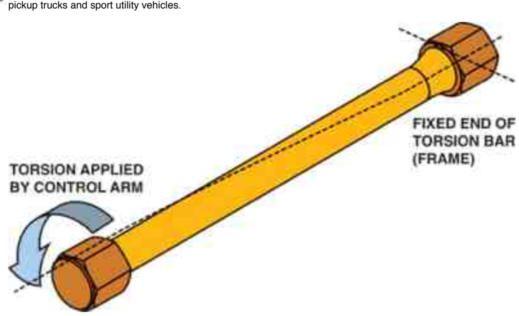

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FIGURE 37.9 A typical SLA front suspension using coil springs.

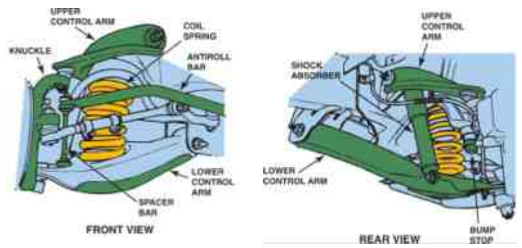

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FIGURE 37.10 A typical MacPherson strut showing all of the components of the assembly. A strut includes the shock and the spring in one structural assembly.

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FIGURE 37.11 Multilink front suspension design varies depending on the vehicle manufacturer.

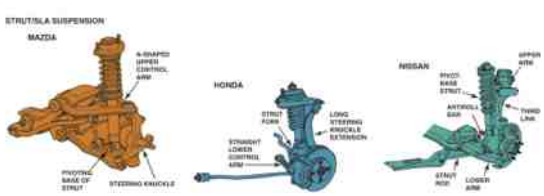

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FIGURE 37.12 A leaking strut. Either a cartridge insert or the entire strut will require replacement. If a light film of oil is seen, this is to be considered normal. If oil is dripping, then this means that the rod seal has failed.

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FIGURE 37.13 It is easy to see that this worn control arm bushing needed to be replaced. The new bushing is shown next to the original.

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FIGURE 37.14 The exhaust was found to be rubbing on the frame rail during a visual inspection. Rubber exhaust system hangers are used to isolate noise and vibration from the exhaust system from entering the interior. These rubber supports can fail, causing the exhaust system to be out of proper location.

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FIGURE 37.15 The steering shaft links the steering wheel to the steering gear while the column jacket, which surrounds part of the shaft, supports the brackets and switches. This steering shaft has a small intermediate section between the main section and the steering gear.

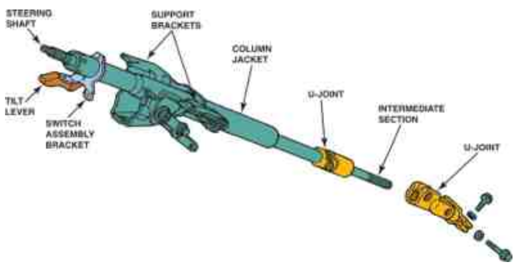

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FIGURE 37.16 As the steering wheel is turned, the nut moves up or down on the threads, shown using a bolt to represent the worm gear and the nut representing the gear nut that meshes with the teeth of the sector gear.

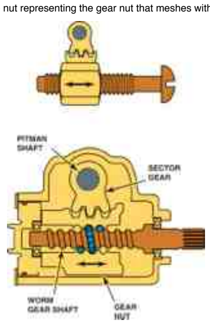

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FIGURE 37.17 Rack-and-pinion steering gear operation is simple, direct, and the rack is in a straight line to the front wheels.

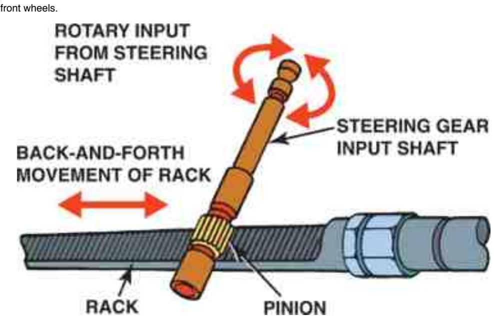

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FIGURE 37.18 A typical rack-and-pinion steering gear as viewed from under the vehicle. A small air tube is used to transfer air between the boots as they extend and compress during turns.

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FIGURE 37.19 Steering movement is transferred from the pitman arm that is splined to the sector shaft (pitman shaft), through the center link and tie rods, to the steering knuckle at each front wheel. The idler arm supports the passenger side of the center link and keeps the steering linkage level with the road. This type of linkage is called a parallelogram-type design.

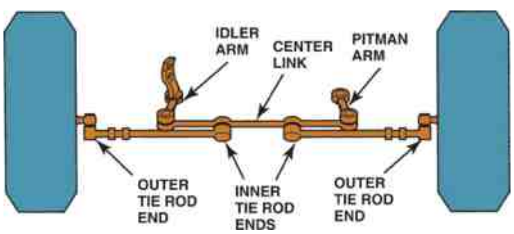

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FIGURE 37.20 Two different styles of tie rod ends. (a) A dual bearing design with a preload spring. (b) The nylon wedge bearing type allows for extended lube intervals. Wear is automatically compensated for by the tapered design and spring-loaded bearing.

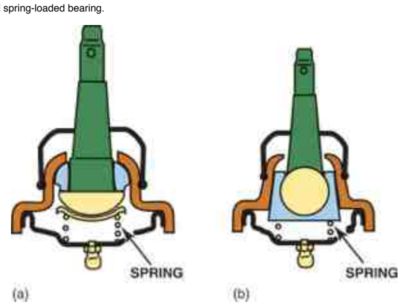

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FIGURE 37.21 All joints should be checked by hand for any lateral or vertical play.

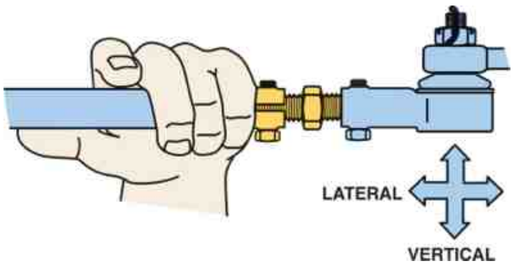

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FIGURE 37.22 Greasing a tie rod end. Some joints do not have a hole for excessive grease to escape, and excessive grease can destroy the seal.

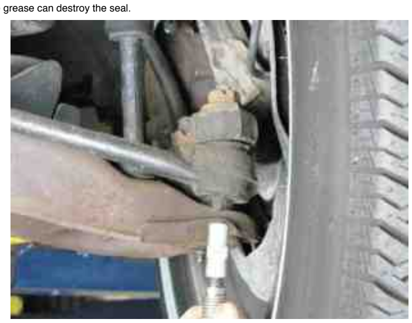

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FIGURE 37.23 Part of steering linkage lubrication is applying grease to the steering stops. If these stops are not lubricated, a grinding sound may be heard when the vehicle hits a bump when the wheels are turned all the way in one direction or the other. This often occurs when driving into or out of a driveway that has a curb.

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