

WHEELS AND RIMS

DESCRIPTION AND MAINTENANCE

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1. GENERAL

1.01 This section describes the basic types of automotive wheels, rims, and component parts most commonly used on cars and trucks. It also covers basic care and maintenance procedures necessary for maximum, safe wheel life.

1.02 Each part of a complete wheel assembly contributes to the overall safe, dependable service that is inherent in wheel design. Therefore, the use of mismatched or worn parts can not only lead to shortened service life but also to possible wheel failure, which is potentially dangerous. In order to detect wear or damage, it is necessary to follow an inspection routine. To prevent parts mismatch, exercise care when replacing with new parts the worn or damaged parts of a wheel assembly.

1.03 A wheel assembly can consist of a disc wheel with a permanently attached one-piece rim, such as used on passenger cars and light trucks, or a disc wheel with a permanently attached rim that uses a lock ring, or a cast spoke wheel with a demountable rim that uses a removable side ring and a lock ring, such as may be used on larger trucks. In addition to the wheel, the rim, and the side and lock rings, the tire and the mounting parts must be considered as a part of the complete wheel assembly.

1.04 Proper mating of tire size to rim size is necessary to avoid excessive stress on the wheel and rim as well as to avoid premature tire failure, and proper size and type of mounting parts is necessary to avoid damage or excessive wear to the wheel and the mounting parts. Wheels and rims are produced by several manufacturers for every size and type of tire. They are produced with differences in load capacities, rim types, mounting holes, and with other design differences. In most cases these differences prevent the interchanging or mixing of parts of one wheel or rim with those of another, but in some cases parts may appear to be interchangeable when, because of design differences, they are not. Remember that most wheel problems are caused by overloading or by using worn, damaged, or mismatched parts.

1.05 Detailed information pertaining to specific applications, parts numbers, etc, of wheels, rims, and mounting parts is available from the National Wheel and Rim Association's wheel catalog and from parts catalogs published by various wheel and rim manufacturers. Before converting to any tires, wheels, rims or mounting parts of different sizes or types than those supplied on any particular vehicle as original equipment, it is advisable to consult a qualified manufacturer's representative.

2. DESCRIPTION

2.01 There are two basic types of wheels used on most trucks, trailers, and cars—the cast spoke wheel with demountable rim, and the disc wheel. These wheels and the wheel parts are illustrated in Fig. 1, 2, and 3 and are described as follows:

Cast Spoke Wheel — A casting that includes the hub and either 3, 5, or 6 spokes that are equipped with studs, clamps, and nuts for retaining a rim.

Rim — The assembly or base on which the tire is mounted. Rims for use with cast wheels are demountable.

Rims for use with disc wheels are a fixed part of the disc wheel. The rim may be of one-piece construction, may be a two-piece assembly with the rim base and a combination side ring and lock ring, or may be a three-piece assembly with the rim base, a side ring, and a separate lock ring.

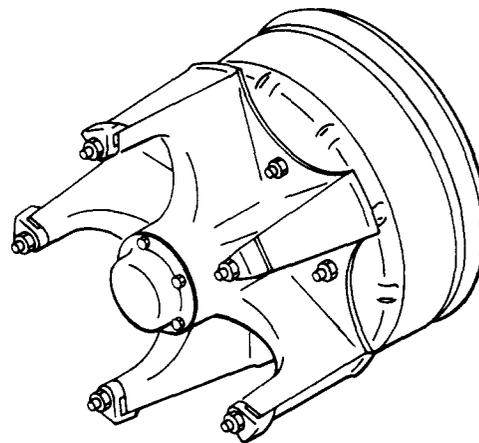
Disc Wheel — A rim that is permanently attached to a disc which supports the rim and provides a means for mounting the wheel. The rim may be any one of the types used with a cast wheel.

Side Ring — The demountable ring that retains the tire on the rim. When designed for use as part of a two-piece rim, the side ring acts as a lock ring. When designed for use as part of a three-piece rim, the side ring is held in place by a separate lock ring.

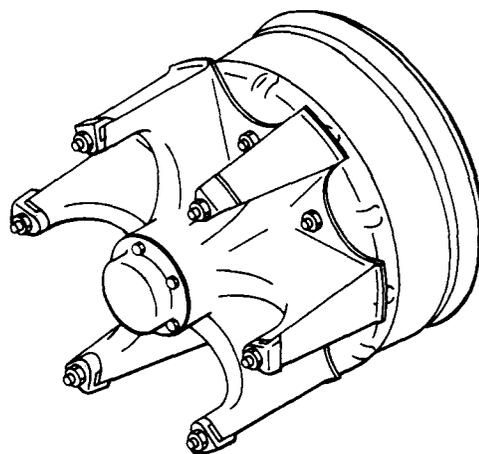
Lock Ring — The demountable ring that holds the side ring of a three-piece rim in place on the rim.

Spacer — A circular band used with cast wheels to hold the two rims of a dual mounting the proper distance apart.

Mounting Parts — The various studs, nuts, and clamps used to attach the wheels and mount the rims. The various mounting parts and their relation to the wheel assembly are illustrated in Fig. 4 and 5.



5 SPOKE WHEEL AND DRUM ASSEMBLY



6 SPOKE WHEEL AND DRUM ASSEMBLY

Fig. 1—Typical Cast Spoke Wheels

2.02 Most wheels, rims, and rings can be identified by a permanently stamped marking that includes the part number and the manufacturer's identity. The location of the markings on wheels will vary. For example, on Budd disc wheels for tube-type tires the part number is usually stamped on the outside of the back flange, but it may be stamped on the inside face of the disc between the stud holes. Other manufacturers of both disc and cast spoke wheels may locate the markings at other places on the wheels, and the location of markings on rims and rings will also vary. In any case once the markings have been found, positive identification of the wheel, rim, or side

ring can be made by referring to the manufacturer's catalog.

3. PRECAUTIONS

3.01 Never mix wheel parts of one manufacturer with those of another. Rims and component parts must be matched by make, type, and size. If there is any doubt about the proper matching of rim and wheel parts, consult the appropriate parts catalog or manufacturer's representative.

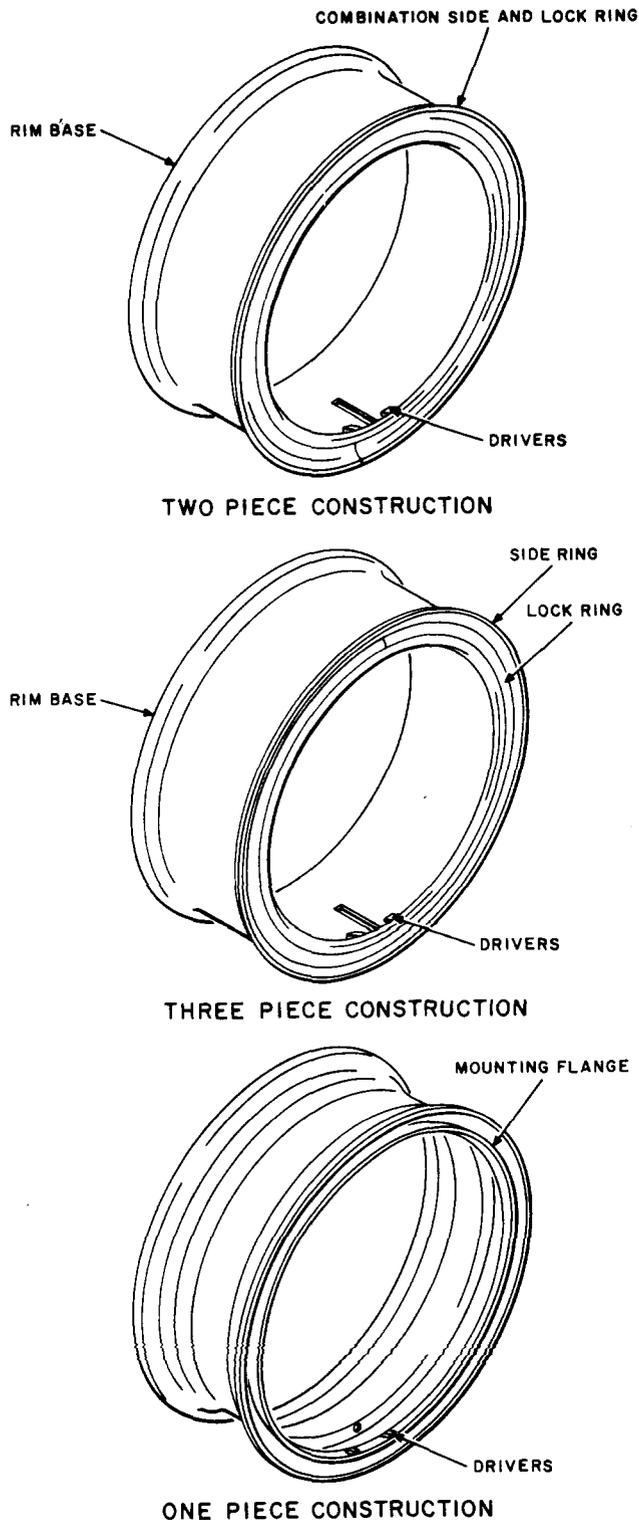


Fig. 2—Example of Three Types of Rim Construction

3.02 Do not attempt to re-inflate a tire that has been run flat without first carefully inspecting the tire and the rim, wheel, and component parts.

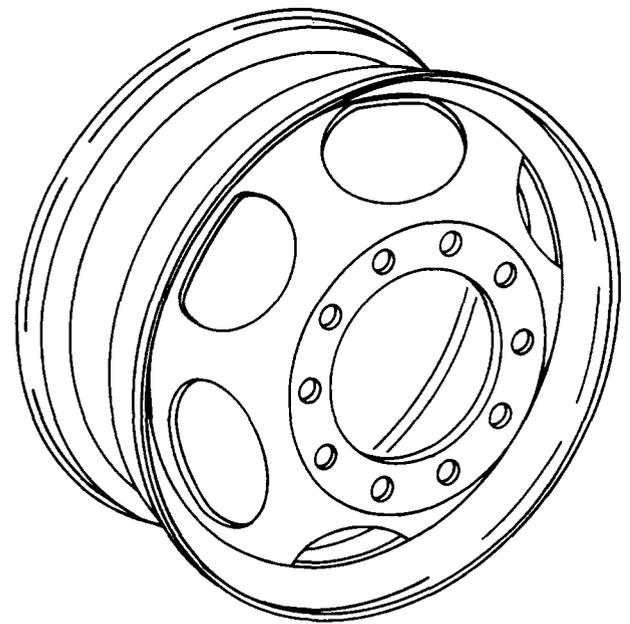


Fig. 3—Typical Disc Wheel

Pay particular attention to an assembly that uses a lock ring to make sure the ring is properly seated.

3.03 Before removing a wheel assembly from a vehicle, make a careful inspection for evidence of damage to the rim or rings. If there is evidence of damage, deflate the tire before removing the wheel assembly. Remove the valve core to be sure of complete deflation.

3.04 When preparing to demount a tire that is mounted on a rim equipped with a lock ring, remove the valve core to make certain all of the air is out of the tire before unlocking the ring.

3.05 Inspect all rim parts for damage, rust, or distortion before mounting a tire and assembling the rim. Do not use rims, locking rings, or flanges that are distorted, rusted, or broken.

3.06 When inflating a tire on a rim equipped with a lock ring, use a cage or guard that will restrain the lock ring if it should break away. If a cage or guard is not available, wrap a heavy chain around the tire and ring and place the tire with the ring side down while it is being inflated.

3.07 Stand away from the valve stem while inflating a tire. Avoid a position where the face or body is directly over the work being done on any tire in which there is pressure.

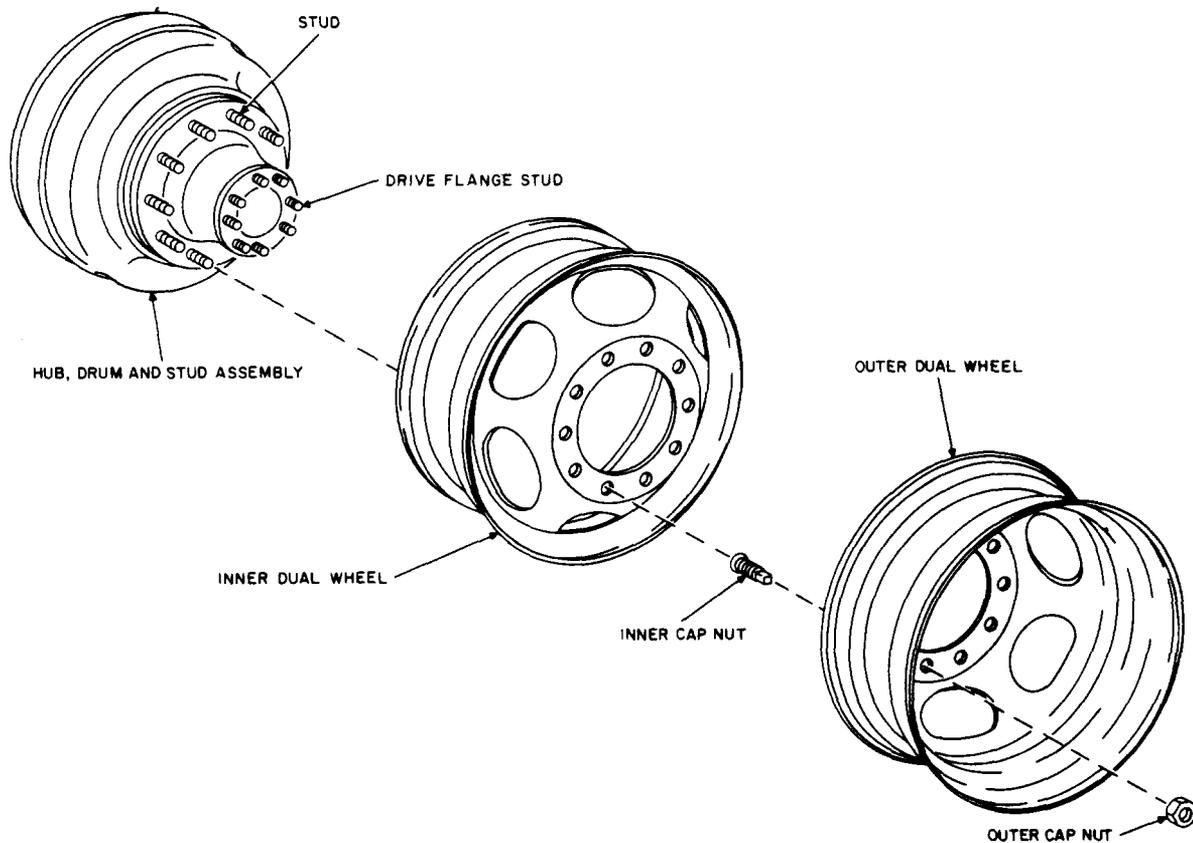


Fig. 4—Disc Wheel Dual-Mounting—Exploded View

3.08 Do not attempt to correct the seating of side or lock rings by hammering when the tire is inflated. Deflate the tire first.

3.09 When changing tires, use only tools and equipment designed for that purpose. The use of pliers, screw drivers, or makeshift tools to force tires on or off of rims or wheels can be dangerous. Do not hammer lock rings or rims with a steel hammer. Use a rubber-covered steel-headed hammer. Use only a rubber mallet on passenger car tires.

3.10 Standard eye protection shall be worn while performing any tire maintenance, repair, or service operation.

3.11 Do not over-inflate tires, over-load the wheel assembly, or use improper size rims for the tires. Over-inflation, over-loading, and using other

than preferred or alternate size rims, as covered in wheel manufacturer's catalogs, are common causes of rim failure.

4. MAINTENANCE

4.01 Wheel and rim maintenance primarily consists of making careful wheel and rim inspections prior to and just after placing a new vehicle in service and thereafter during each regular tire inspection and during each tire change. If wheels and rims are regularly inspected for damage, improperly tightened nuts or clamps, and for excessive rust or corrosion, and if wheels and rims are properly mounted and not overloaded, maximum, safe wheel life will be assured.

4.02 Before placing a new vehicle in service, demount the wheels and check all mounting surfaces and ball seats for paint or other obstructions,

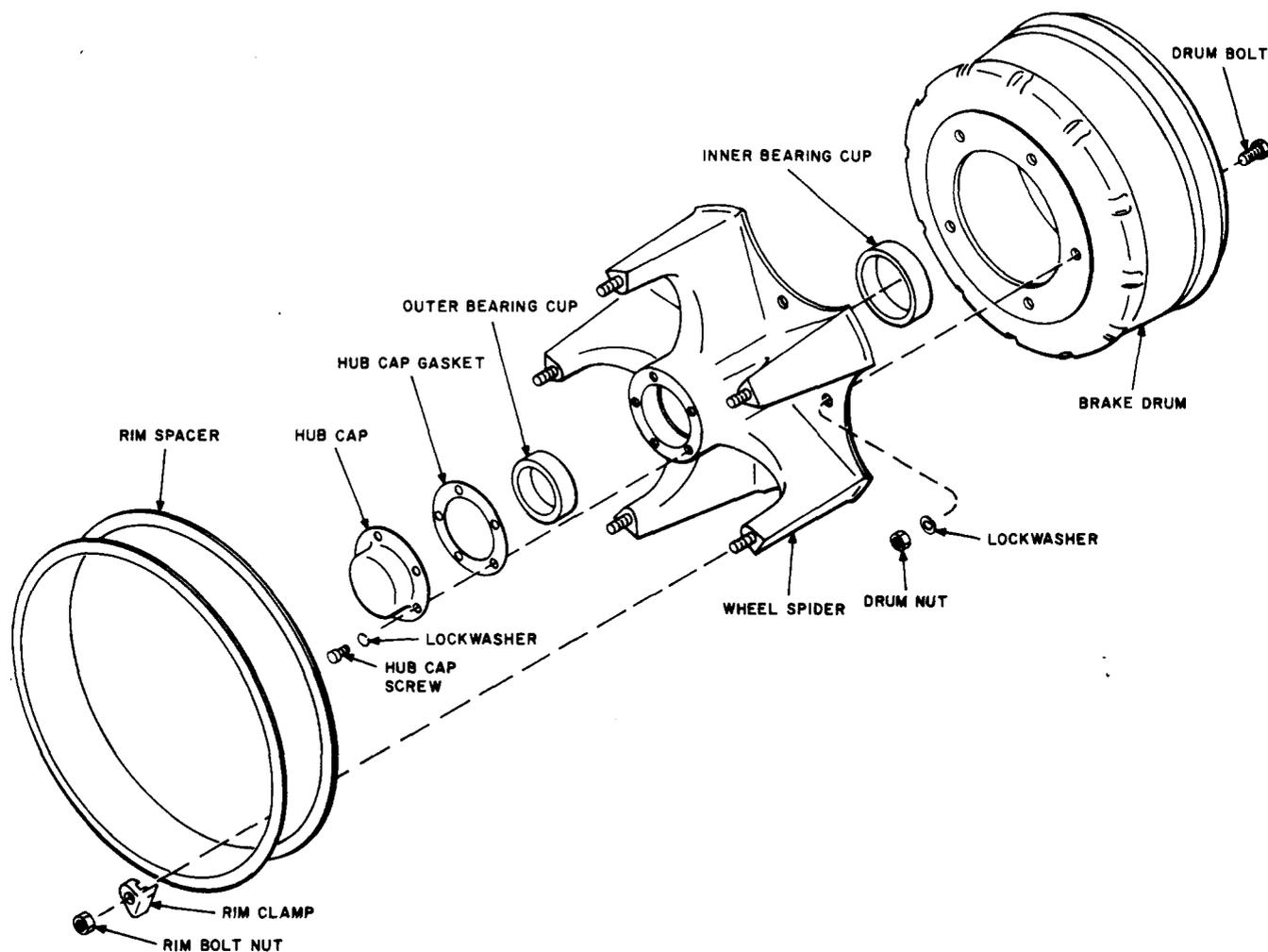


Fig. 5—Cast Spoke Wheel—Exploded View

such as dirt, burrs, etc, that could prevent wheel to hub or wheel to wheel contact. Check the studs and nuts for cross threading, dirt, or damage. Remount the wheels making sure the cap nuts are securely seated and properly torqued.

4.03 After the vehicle has been operated for a short time, recheck tightness of wheel nuts. On dual assemblies, loosen outer nuts, check torque of inner nuts, and retighten outer nuts. Tighten all nuts to recommended torque given in Table A.

Note: The CORRECT torque is necessary. Insufficient mounting torque can cause slippage which leads to wear, and excessive torque can strip studs, crush ball seats, or lead to other damage.

4.04 Each time tire inflation is checked, make a visual inspection of the wheel assembly. Look for evidence of loose cap nuts (rust coming from ball seats indicates a loose mounting), broken studs, rim and wheel damage, and improperly seated lock rings.

4.05 At each tire change, make a complete inspection of the wheel, rim and mounting parts. A thorough cleaning of the wheel will aid in locating cracks, chips, dents, etc. Wheel inspection and maintenance during a tire change should include the following.

- (1) Remove all dirt, grease, burrs, etc, from mounting face of hub or drum. Be sure all drum retaining screws in out-board drums are

TABLE A

TORQUE TABLE		
APPLICATION	STUD OR BOLT SIZE AND THREAD	RECOMMENDED TORQUE IN FOOT/POUNDS
PASSENGER CARS	7/16" — 20	75-85
	1/2" — 20	75-85
	9/16" — 18	80-90
LIGHT TRUCKS	7/16" — 20	75-85
	1/2" — 20	75-85
	9/16" — 18	80-90
	5/8" — 18	140-170
	11/16" — 16	250-300
HIGHWAY VEHICLES — TRUCK — TRAILER — BUS		
With Disc Wheels		
Budd Standard Mounting — countersunk holes	3/4" — 16	450-500
Budd Standard Mounting — countersunk holes	1-1/8" — 16	450-500
Motor Wheel Studs	9/16" — 18	175-225
Motor Wheel Spoksteel Studs — straight stud holes	3/4" — 16	300-350
Motor Wheel Bus — Front Wheels and single rear	7/8" — 14	325-375
Motor Wheel Bus — Dual rear wheels	7/8" — 14	350-400
Back Nuts — on inner end of wheel stud	3/4" — 16	175-200
Back Nuts — on inner end of wheel stud	7/8" — 14	175-200
With Cast Wheels		
With Cast Wheels — Demountable Rims	1/2" — 13	90
With Cast Wheels — Demountable Rims	5/8" — 11	150-175
With Cast Wheels — Demountable Rims	3/4" — 10	175-200
Special Torque Data for Erie Wheels	5/8" — 11	180-200
Special Torque Data for Erie Wheels	3/4" — 10	270-295
Note: The threads of the studs, bolts, nuts, and the bearing surface should be clean, dry, and free from oil or grease when torqued to the specified foot pounds.		

securely seated and in good condition. If hub face is visibly worn, it must be repaired or replaced.

(2) Clean the stud threads and inspect for wear or damage. Replace worn or damaged studs. When replacing a broken stud in a 10-stud mounting, also replace the stud on each side of the broken stud. If a stud is broken on mountings with less than ten studs, replace all the studs. Stripped or damaged stud threads may result from excessive torque or from carelessness when placing the wheel over the studs.

(3) Check cap nuts for wear. If wear can be detected, replace the nut. Worn cap nuts are usually caused by a loose mounting.

(4) Check ball seats and flat mounting faces of the wheels for wear. Check for out-of-round stud holes and for the presence of metal build-up around the holes. These indications of operating with loose mountings mean that the wheel should be replaced.

(5) Look for cracked or damaged rims and for cracks in the area of the stud holes or hand holes. Cracked wheels or rims can result from a loose mounting or from overloading. Cracked wheels or rims should be replaced.

(6) Check rim gutters for any accumulation of rust or foreign matter that could interfere

with proper seating of the ring. Replace rings that are damaged or sprung. Replace wheels, rims, or rings that are severely rusted or corroded.

4.06 The proper tightening of nuts is one of the most important parts of wheel maintenance. After placing a *disc wheel* over the studs, tighten the nuts until snug following the order shown in Fig. 6. After the nuts are snug, repeat tightening order to bring each nut to the proper torque. For wheels with fewer studs, follow a similar order always tightening opposites. For *cast* wheels, select any three nuts that form a triangular pattern as shown in Fig. 7. Snug up nut No. 1; rotate wheel to place nut No. 2 on top and turn it until snug; rotate wheel to place nut No. 3 on top and turn it until snug. Repeat the procedure to bring the three nuts to the proper torque, and then bring remaining nuts to proper torque.

4.07 The best means of determining torque accurately is to use a torque wrench. However, an air wrench or a standard wrench and extension handle will give satisfactory results if

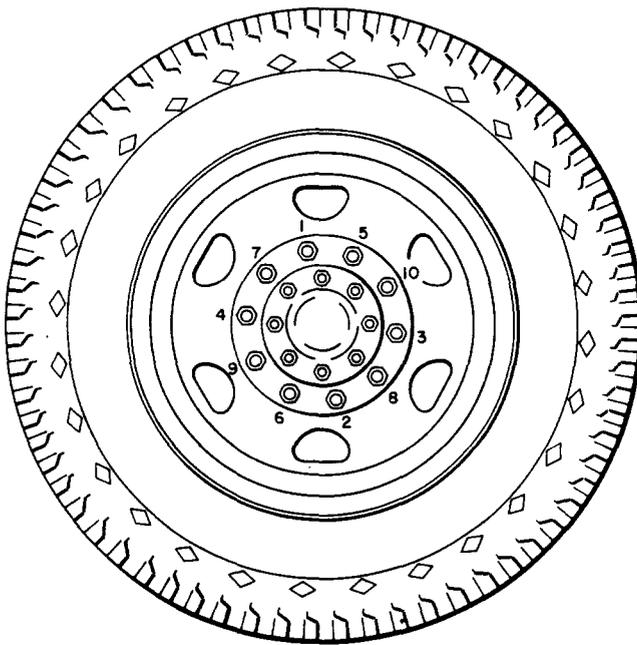


Fig. 6—Sequence For Tightening Cap Nuts

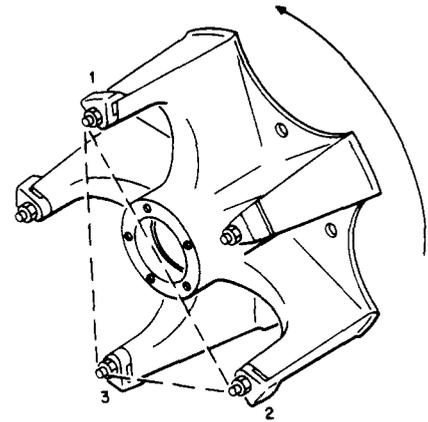


Fig. 7—Sequence for Tightening Rim Bolt Nuts

used properly. Since the output of an air wrench is determined by the line pressure of the air system, it is essential that the torque being delivered be checked at regular intervals to prevent over tightening or under tightening. The standard wrench and extension handle can be used with reasonable accuracy if it will be remembered that foot/pounds of torque is nothing more than weight applied on the handle times the distance in feet from the nut. For example, if a man who weighs 150 pounds *steadily* applies his full weight 3 feet out on the extension until the nut will no longer turn, 450 pounds of torque on the nut will be the result (150 lbs x 3 ft = 450 ft/lbs torque).

Note: Be sure the end of any wrench used is smooth. If not, it will wear grooves in the wheel in the area around the cap nuts.

5. TROUBLE SHOOTING

5.01 If the cause of wear or damage is known, corrective action can usually be taken to prevent the trouble from recurring. The most common troubles and their causes are given in the following list.

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TROUBLE	CAUSE — CORRECTIVE ACTION	TROUBLE	CAUSE — CORRECTIVE ACTION
Cracks from hand hole to stud hole, rim or other hand hole	Usually caused by overloading. Check actual load on wheel affected.	Broken rings	Caused by improper assembly or careless use of tire irons. A small gouge in a ring can eventually lead to a break.
Cracks from stud hole to stud hole	Indicates loose mounting. Check for worn hub, studs, or stud groove in hub.	Worn hub face	Results from loose mounting.
Worn stud holes	Indicates loose mounting. Check for proper torque and for wear that could lead to wheel cracks.	Worn stud grooves in hub	Result of improper initial assembly or loose cap nuts.
Cracked rims and rim flanges	Usually caused by overloading or metal fatigue. Check operating load and tire size.	Damaged stud threads	Probably caused by improper handling or excessive torque.
Sprung rings	Caused by careless or improper removal. The ring should be gradually worked off and not forced completely out of the rim gutter.	Broken studs	Probably caused by loose mounting.
		Freezing of cap nut	Caused by corrosion or galling. On dual disc wheels, can be caused by under tightening inner cap nut or over tightening outer cap nut. In cases of corrosion apply lubricant to first three threads. Never allow lubricant to contact ball seat or ball face of cap nut.