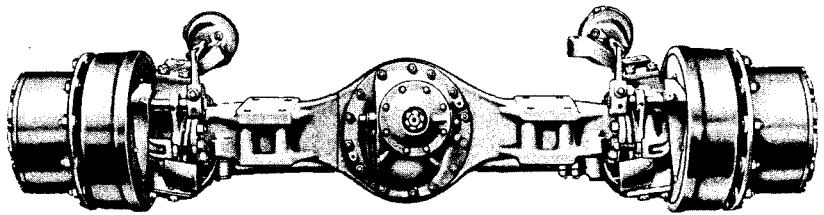


Field Maintenance Manual No. 9

Planetary Axles

Steering and Rigid



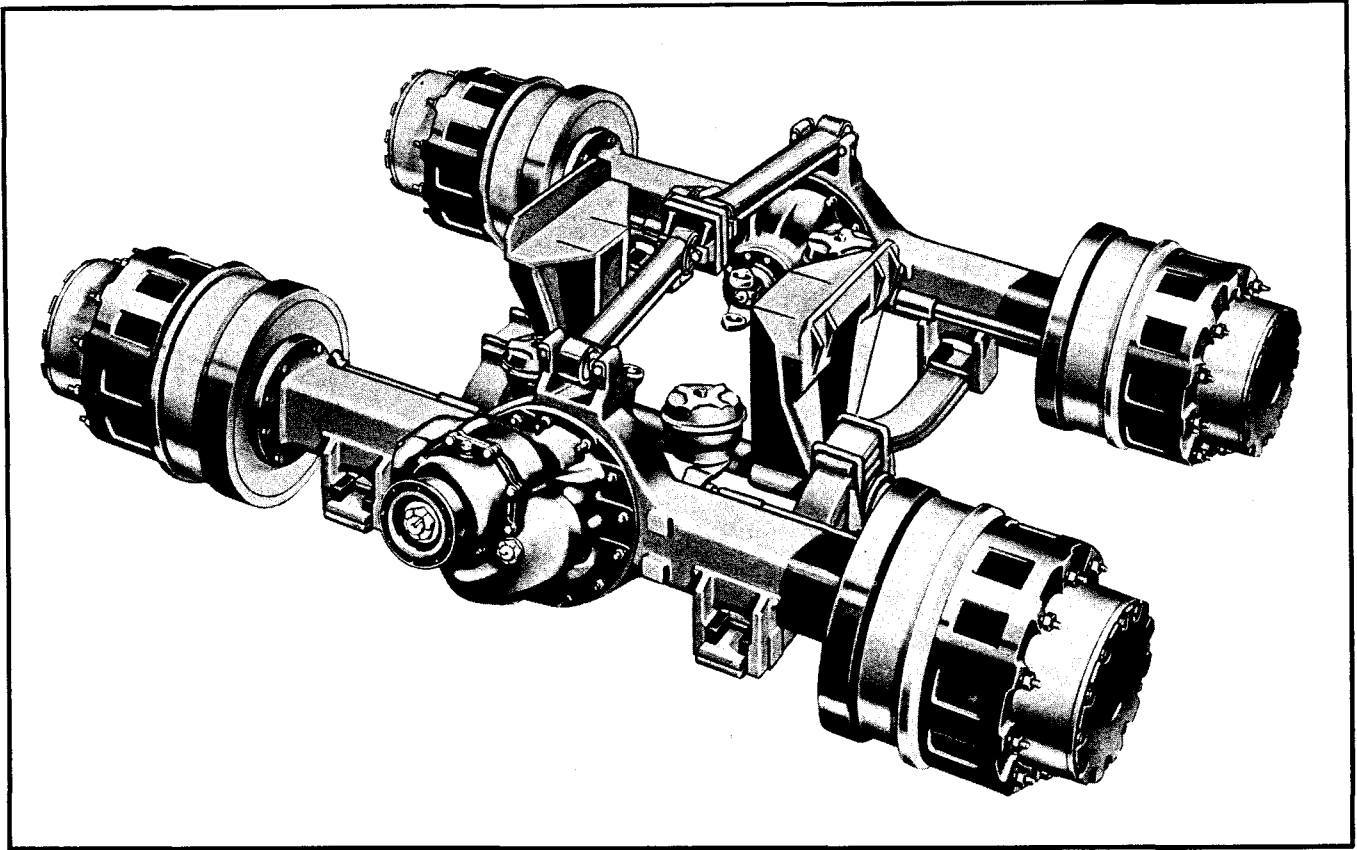
Use Only Genuine Rockwell-Standard Parts



North American Rockwell

Transmission and Axle Division
Detroit, Michigan 48232

PLANETARY AXLES



PLANETARY RIGID (PR) TANDEM WITH ROCKWELL-STANDARD
TAPER LEAF TANDEM SUSPENSION

CARE AND MAINTENANCE

The Rockwell-Standard Planetary Axles incorporate a single reduction carrier with bevel or hypoid gearing mounted in the axle center. The second reduction is of Planetary Design Spur Gearing built into the wheel hubs.

Rockwell-Standard Planetary Axles permit the bevel or hypoid gearing of the carrier, and the axle shafts to carry only a nominal torsional load while at the same time providing the highest practical numerical gear reduction at the wheels.

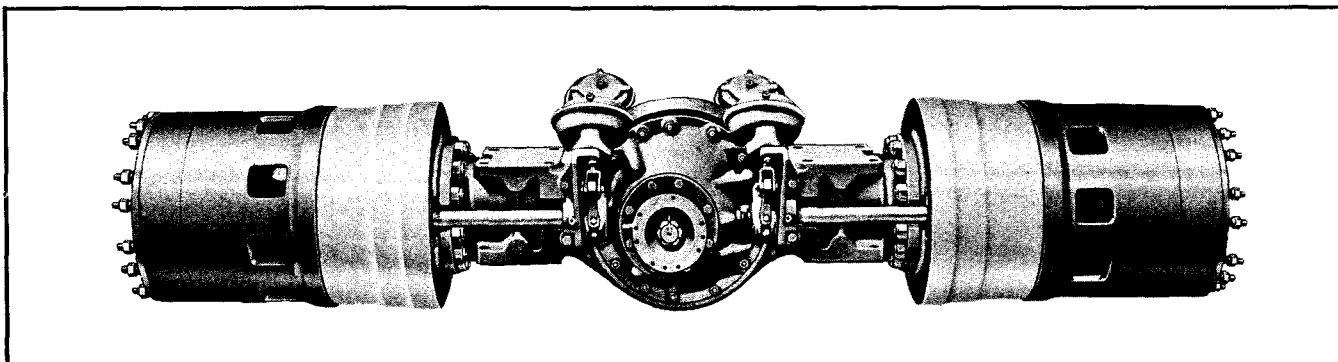
The Hypoid Pinion and Differential assembly of the first reduction are supported by tapered roller bearings. The pinion bearing preload is adjusted and maintained by a hardened precision

spacer between the inner and outer bearings. The differential tapered bearing preload is adjusted and maintained by the positioning of the threaded adjusting rings in the carrier leg and cap bores.

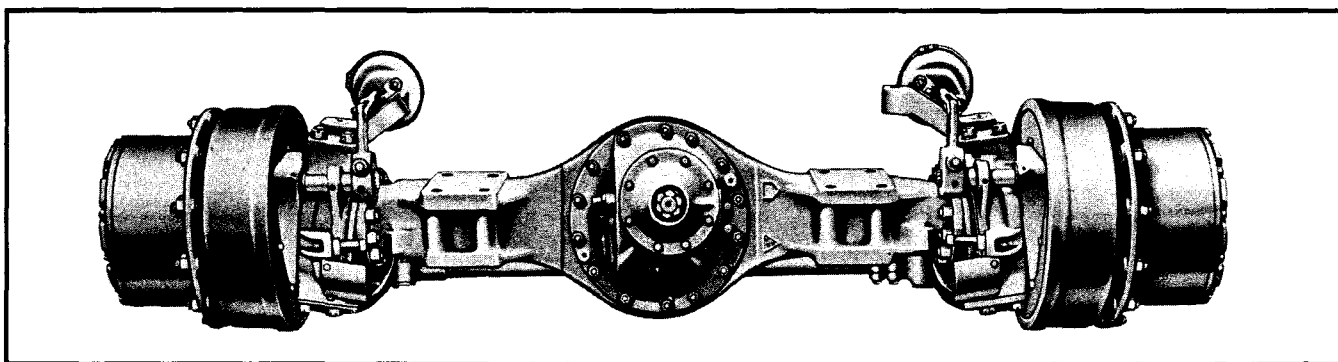
The spur teeth of the sun gear (which floats) mesh with teeth of the planet spur gears. The planet spur gears rotate on planet pins which are mounted in a spider. The planet spur gear teeth in turn mesh with teeth of the floating ring gear.

Power is transmitted by the pinion and gear of the first reduction to the axle shafts empowering the sun gear of the second reduction, through the revolving planet gears, and into the planetary spider which drives the wheel hub.

The servicing of the single reduction carrier assembly used in the planetary housing center is thoroughly covered in our Field Maintenance Manual No. 5 (or 5A if drive unit is the through-drive type).



PLANETARY RIGID TYPES (PR)

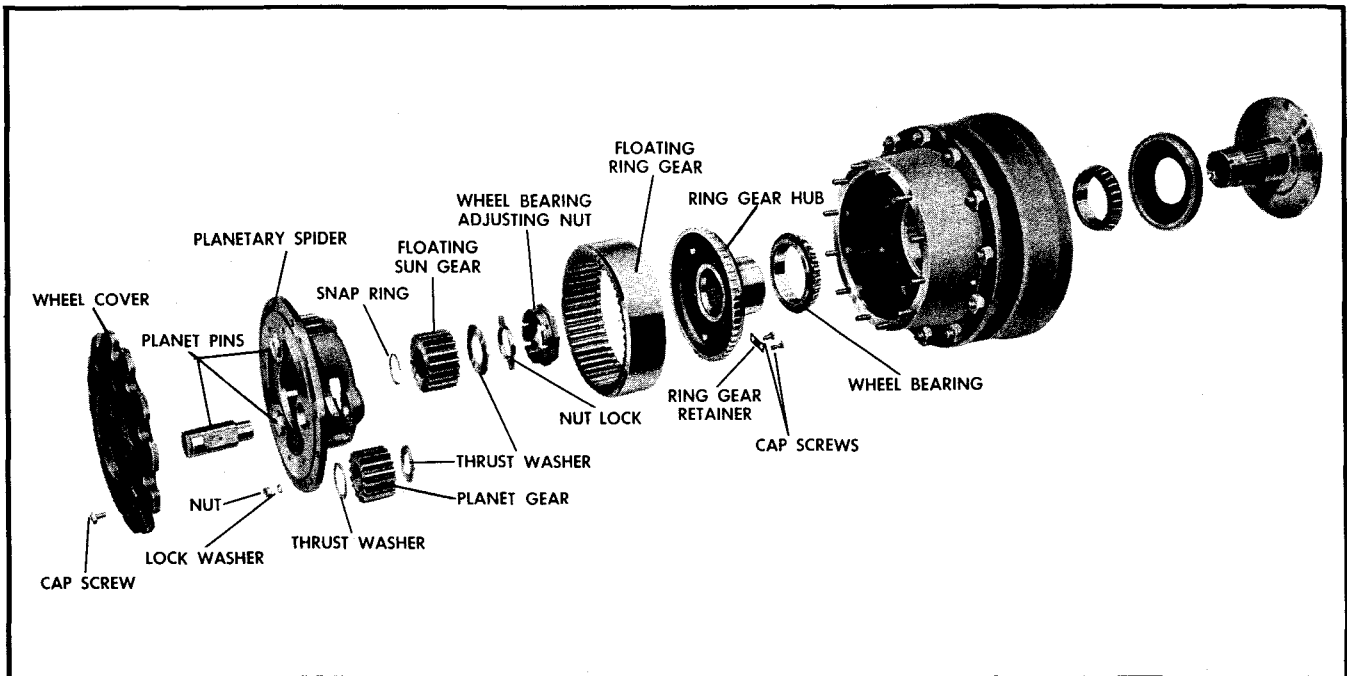


PLANETARY STEERING TYPES (PS)

DISASSEMBLY OF PLANETARY OUTER ENDS

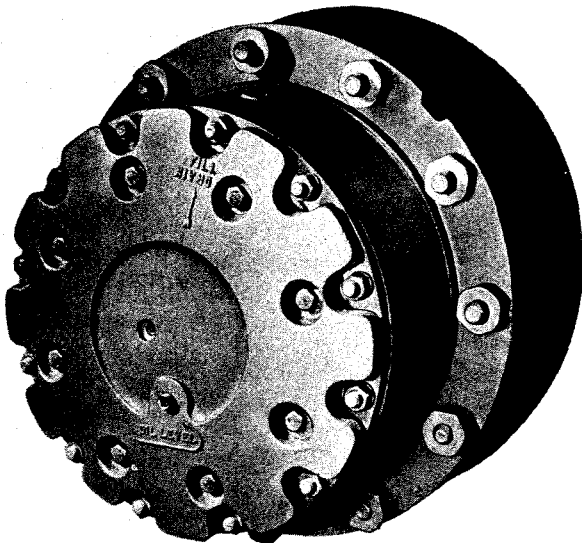
Before starting the disassembly of either the Planetary Steering type or Planetary Rigid type axles the following procedure and precautions should be taken:

- A. Jack up both ends of axle so that tires clear the ground. Due to the extreme weight of vehicles under which planetary type axles are used, the axle should then be blocked up under each spring seat to safely support the weight and hold axle at this level. The jacks may then be removed to provide adequate working space with no danger of axle end falling or shifting.
- B. Remove the wheel nuts or rim lug nuts where employed.
- C. Remove the tire and wheel or tire and rim where employed.
- D. Rotate hub assembly so that the drain plug is at the bottom.
- E. Remove the plug and drain lubricant.



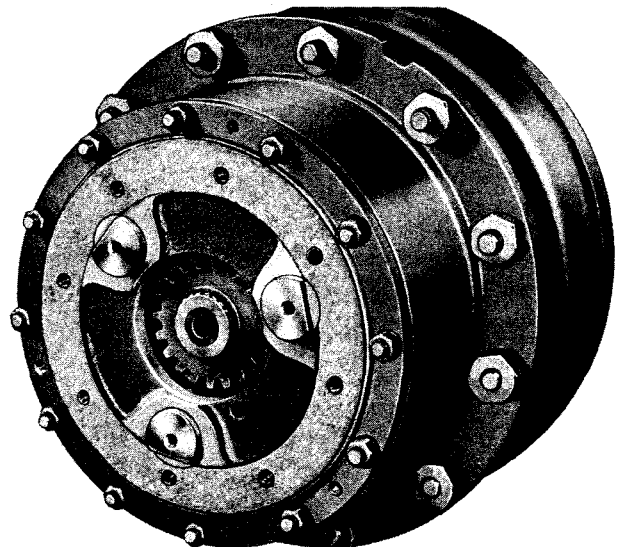
Exploded view illustrating the conventional arrangement of component parts used in both the steering model and rigid model planetary wheel outer ends.

DISASSEMBLE THE PLANETARY ASSEMBLY



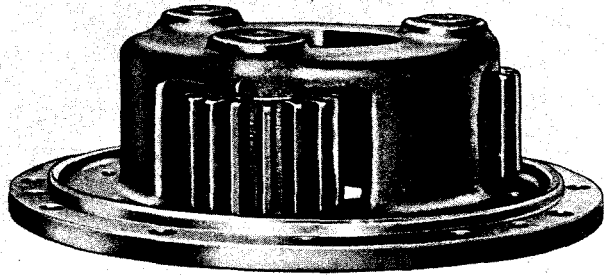
A. Remove the planetary wheel cover cap screws.

B. Remove the planetary wheel cover.



C. Remove the cover to planetary spider gasket.

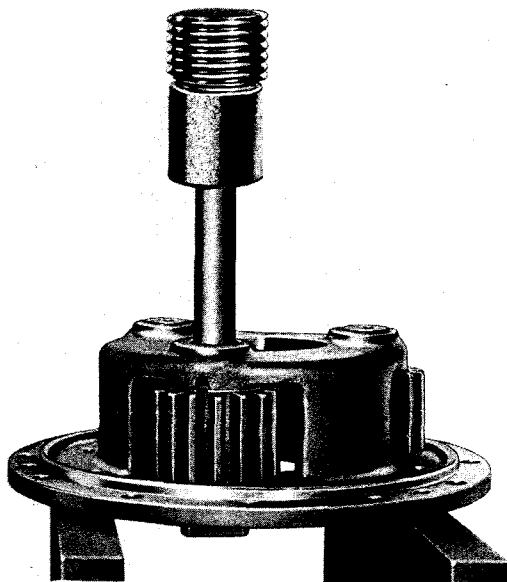
D. Remove the planetary spider stud nuts and lock washers.



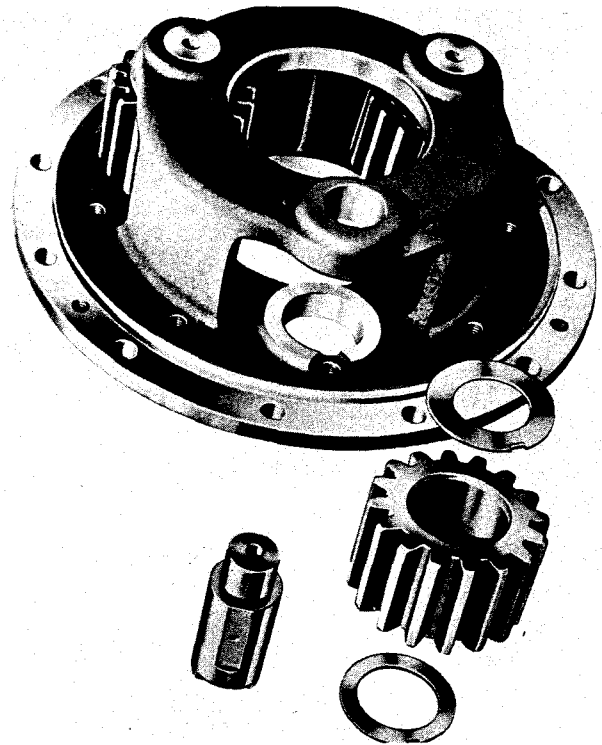
- E. Separate and remove planetary spider assembly from wheel hub assembly by use of puller screws in threaded holes provided in the spider flange.
- F. Remove planetary spider to hub gasket.

DISASSEMBLE PLANETARY SPIDER ASSEMBLY

Planetary spur gears rotate on planet pins. Each gear rotates between hardened thrust washers.

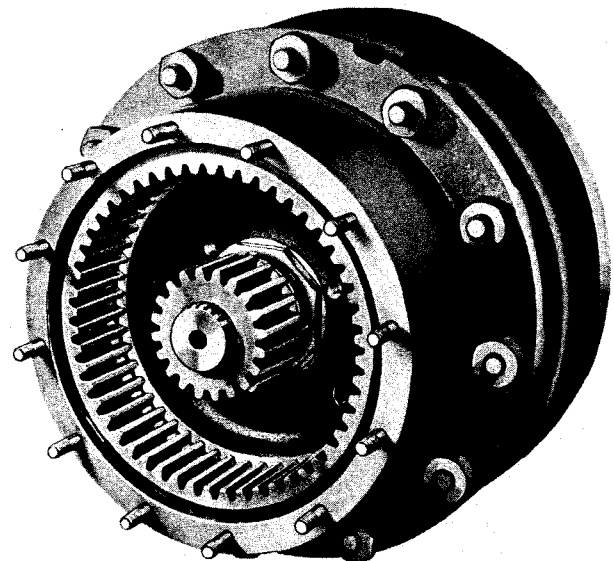


- A. Press out the planet gear pins as shown.
- B. Remove the planet gears and their respective thrust washers.



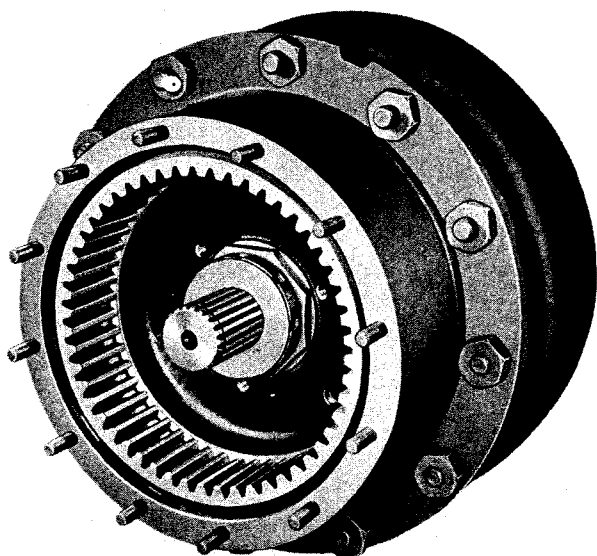
NOTE: Thrust washers are designed for opposite sides of planet pinions and can only be installed in their correct locations.

REMOVE THE FLOATING RING GEAR ASSEMBLY



PS and Smaller PR Models

- A. Remove the lock ring from end of axle shaft.



B. Remove the axle shaft sun gear.

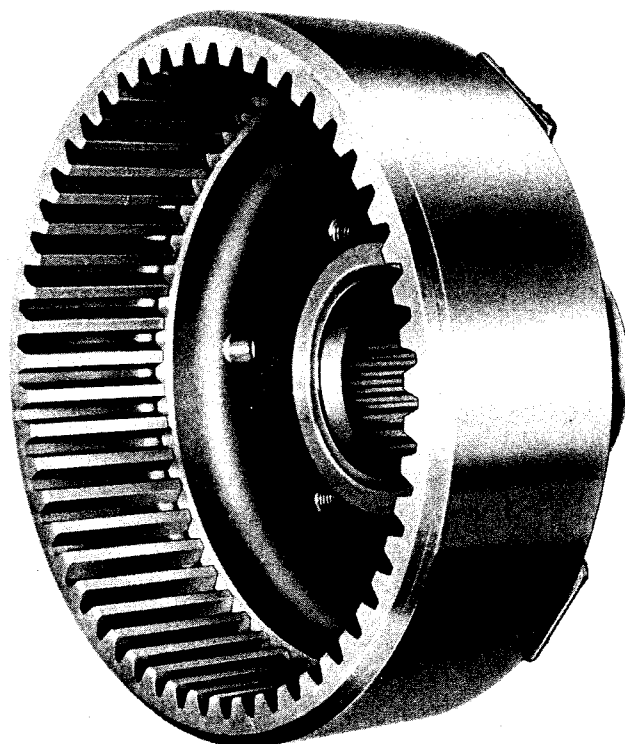
NOTE: On some of the larger PR models the axle shaft and sun gear are integral. On these models remove the complete axle shaft, exercising care not to damage the oil seal. The sun gear thrust washer may then be removed from the axle shaft.

C. Remove the sun gear thrust washer.

D. Remove the axle shaft on rigid models that do not employ the integral sun gear.

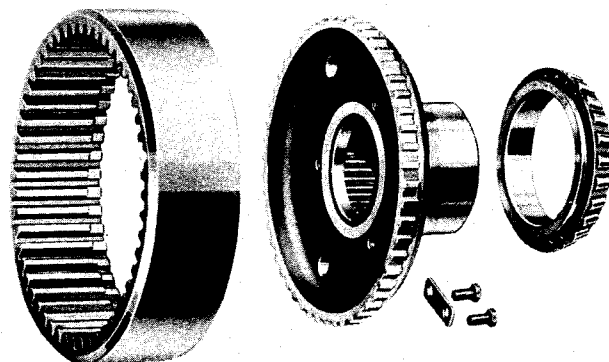
E. Remove the wheel bearing adjusting nut lock. (Wheel bearing adjusting nuts are all of the single nut construction and may be locked to the hub spindle in different methods depending on model.)

F. Remove the wheel bearing adjusting nut.



G. Remove the floating ring gear assembly. Puller screw holes are provided in the ring gear hub flange to start gear.

1. The floating ring gear is splined to the ring gear hub and secured by four evenly spaced plates, each plate being attached by two cap screws which are lockwired together.
2. The outer wheel bearing is mounted on the ring gear hub.



H. Separate the ring gear and ring gear hub by removing lock wire, cap screws and plates.

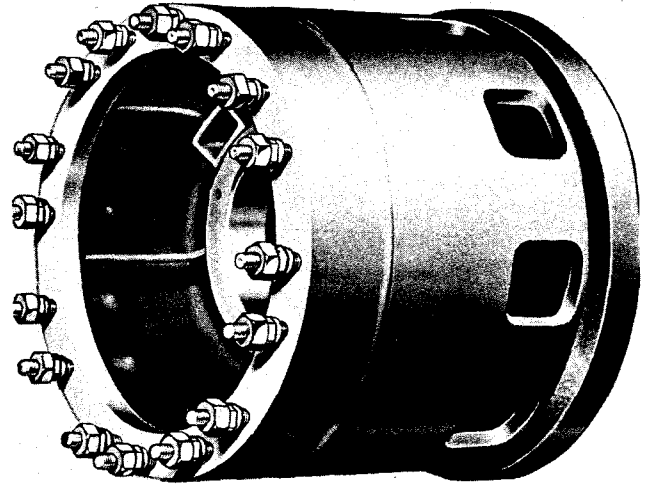
I. Remove outer wheel bearing from ring gear hub.

- J. The ring gear hub assembly is made up of the hub and a hardened ring sleeve insert which is pressed into the hub from the outer side.

Larger PR Models

The larger PR models are also provided with threaded puller screw holes in the ring gear hub flange. In back of the ring gear hub flange there are also threaded holes of smaller size in the hub spider which will align with the puller screw holes of gear hub flange.

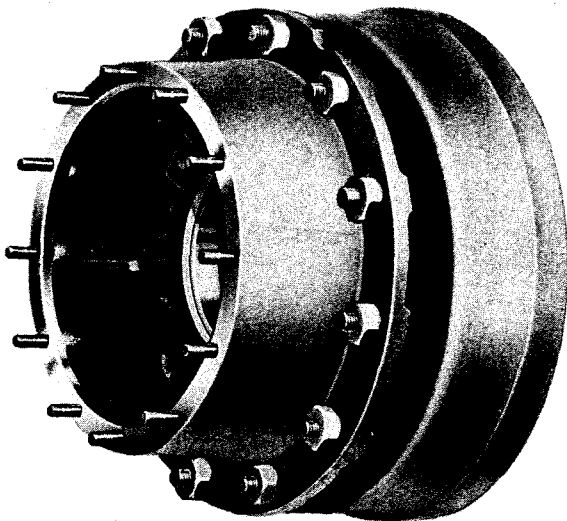
- A. Turn the complete hub assembly so that the puller screw holes in the ring gear hub flange entirely miss the smaller holes of the hub spider in back.
- B. Install puller screws and turn in until they butt against the flat surface of the hub spider.
- C. Tighten puller screws alternately to jack ring gear assembly out.



Hub and drum assembly as used on larger PR models: On assemblies of this size it becomes necessary to handle by use of chain falls.

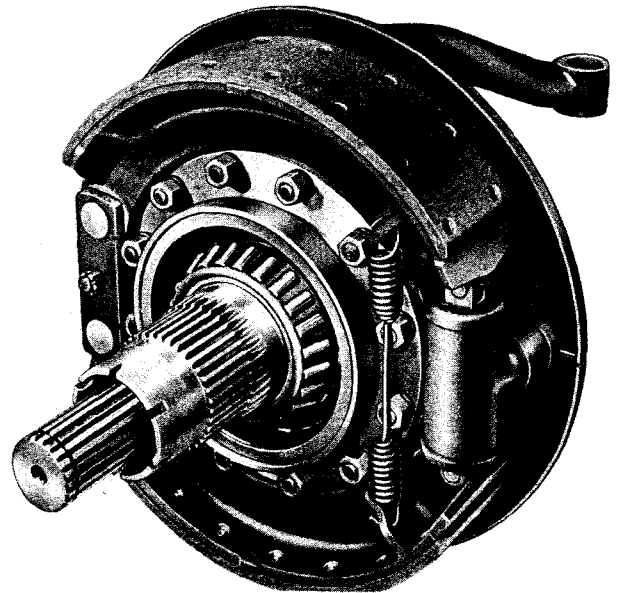
- B. If wheel bearings are to be replaced, remove wheel bearing cups with a suitable puller.

REMOVE THE WHEEL HUB AND DRUM ASSEMBLY



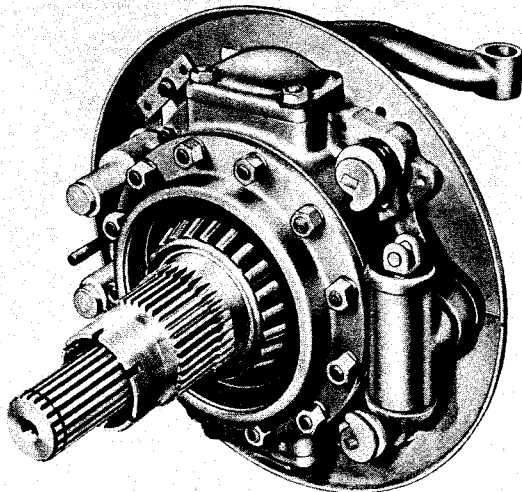
- A. Lift the hub and drum slightly to relieve the hub weight and drum to brake shoe drag and remove the assembly from the hub spindle.

DISASSEMBLE BRAKE SHOE AND LINER ASSEMBLY

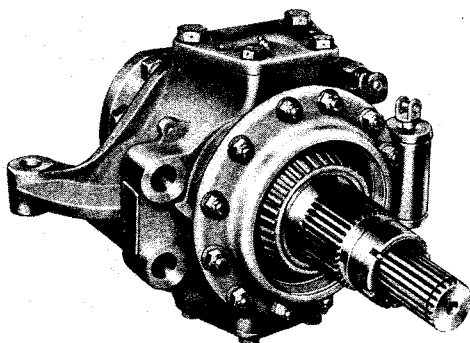


On planetary axles equipped with hydraulic brakes, the complete disassembly of the brakes is not necessary for the removal of the hub spindle. Adequate working clearance is provided by only removing the brake shoe return spring.

- A. If the brake shoe and liner assemblies are to be removed for service or inspection, unhook and remove the brake shoe return spring.
- B. Remove anchor pin plate cotter key, stud nut and plate.



- C. Remove the brake shoe and liner assemblies. For complete disassembly, remove push rods and brake cylinder.



PS 250 Type

Service and Maintenance for the hydraulic brake series may be found in Field Maintenance Manual No. 4.

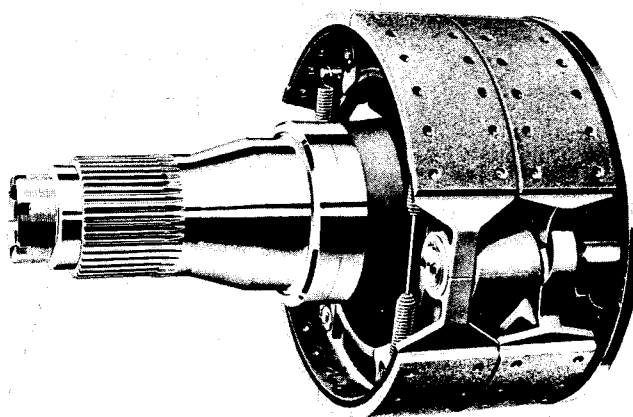
Hub spindles on planetary axles equipped with air brakes of standard double shoe construction may also be removed, without the complete disassembly of the brake assembly. Adequate working clearance is provided by only the removal of the brake shoe return spring.

- A. If the brake shoe and liner assembly are to be removed for service or inspection, unhook and remove the brake shoe return spring.
- B. Remove the anchor pin locks, felts and felt retainers.

- C. Remove the brake shoe and liner assemblies.
- D. For complete disassembly, remove the chambers, slack adjusters and cam shafts.

Service and Maintenance for the "P" series brake may be found in Field Maintenance Manual No. 4.

Planetary axles of extra heavy capacity employ the "Twin P" brake. On this type of axle it is impossible to remove the hub spindle without first removing both sets of brake shoes.



SPINDLE WITH DOUBLE BRAKE ASSEMBLY AS USED ON LARGER PR AXLES

- A. Disassemble outer shoe assembly.
 - 1. Unhook and remove the brake shoe return springs.
 - 2. Remove the anchor end snap rings, retainers and felts.
 - 3. Remove the guide pin cotter keys, nuts and washers or turn out guide pins.
 - 4. Remove the upper and lower outer shoe and liner assemblies.
- B. Disassemble inner shoe assembly.
 - 1. Unhook and remove the brake shoe return springs.
 - 2. Turn out and remove the inner shoe guide pins.
 - 3. Remove the upper and lower inner shoe and liner assemblies.

C. Due to the construction of the brake spider being integral with the hub spindle it is necessary to remove both cam shafts to enable further disassembly of the hub spindle.

1. Disconnect chamber push rod to slack adjuster linkage.
2. Remove cam shaft lock ring, slack adjuster washers, felts, retainers and collar while threading cam shaft out. Split cams joined by splined couplings are employed at both forward and rear.
3. Cam shafts on carrier side of axle must be separated at the splined coupling and chamber bracket, slack adjuster and shaft portion next to carrier removed before the wheel end of cam shaft is threaded out toward the axle center.
4. It is not necessary to remove the chamber bracket on side opposite the carrier. Cam may be threaded outward by separating cam at splined coupling.

Newer models use the type oil seal shown in lower left photograph; this seal is held in place by the knuckle flange stud nuts.

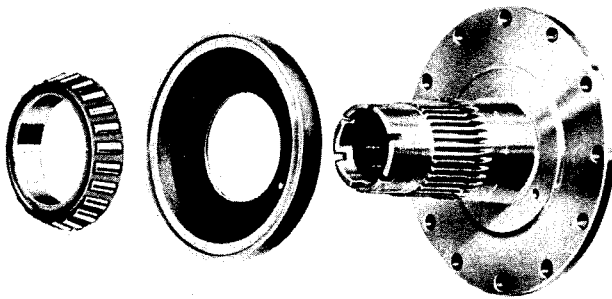
C. On PR models the oil seal and retainer assembly is located in the hub against the hub rear bearing cup and wipes the hub spindle. Remove the retainer and seal assembly from hub with a suitable puller. Remove bearing.

NOTE: Do not remove the oil seal from the retainer on either PS or PR models unless replacement is necessary.

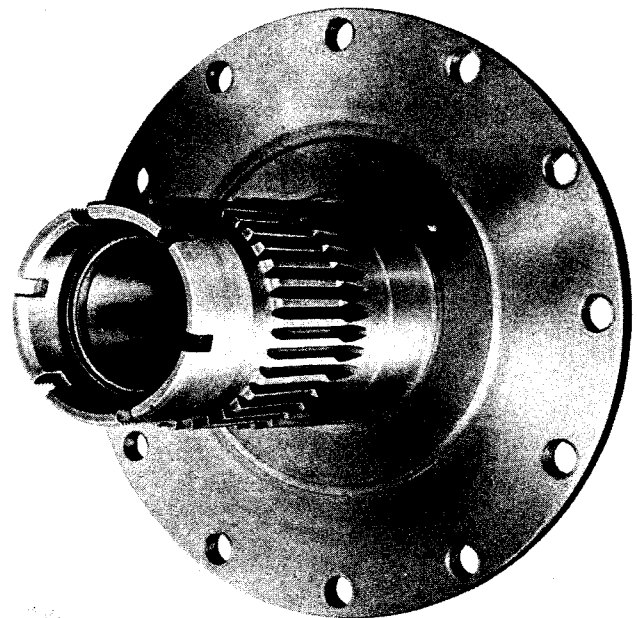
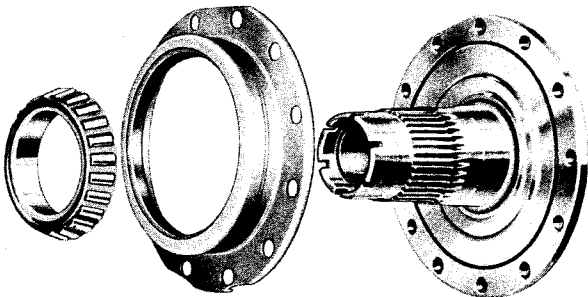
D. Remove the hub spindle stud nuts and lock washers on PS models, or bolts, nuts and lock washers on PR models.

DISASSEMBLE HUB SPINDLE ASSEMBLY

A. Remove the inner wheel bearing (PS models).

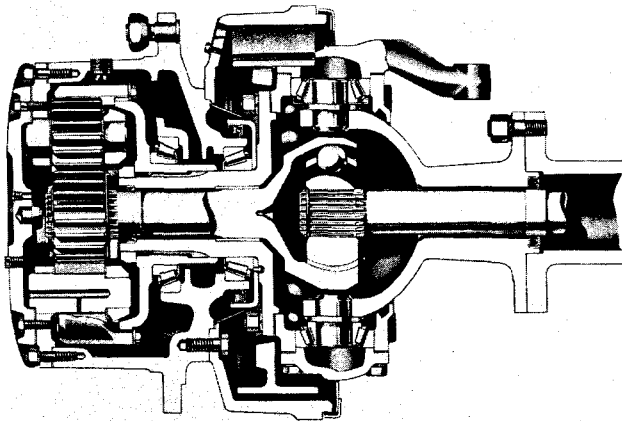


B. Remove hub spindle retainer and oil seal assembly. Retainer is held in position against spindle flange by a dowel.

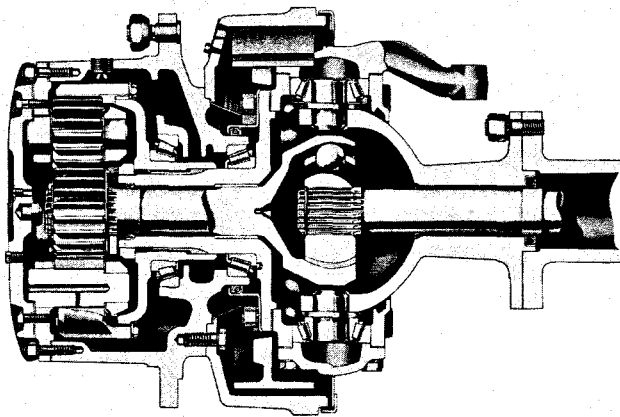


E. Remove the hub spindle. Care must be taken on steering models not to damage the outer oil seal, in bore of spindle, while sliding past axle shaft splines. Due care must also be exercised not to damage the "O" ring seal in the recess of housing mating end of spindle on PR models.

PLANETARY STEERING KNUCKLES

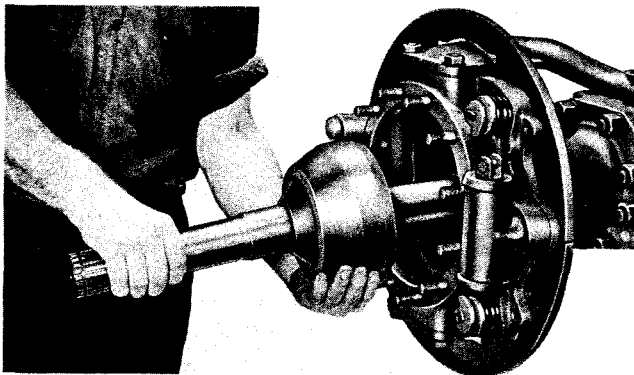


Older PS Models



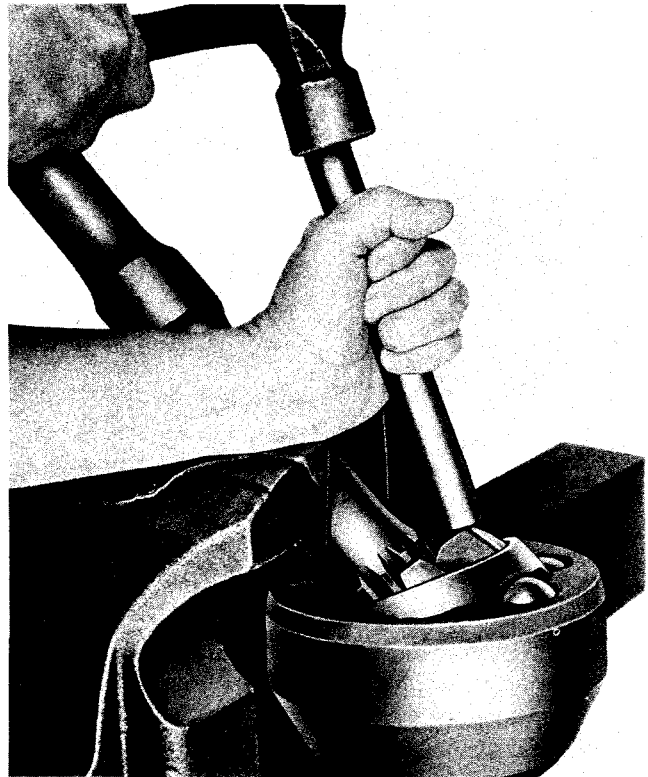
Current PS Models

REMOVE AXLE SHAFTS



Remove the axle shaft and ball joint assembly from the housing assembly. Care must be exercised not to damage the oil seal in the housing.

- A. Clamp the inner shaft into a bronze jawed vise with outer race bell in downward position.



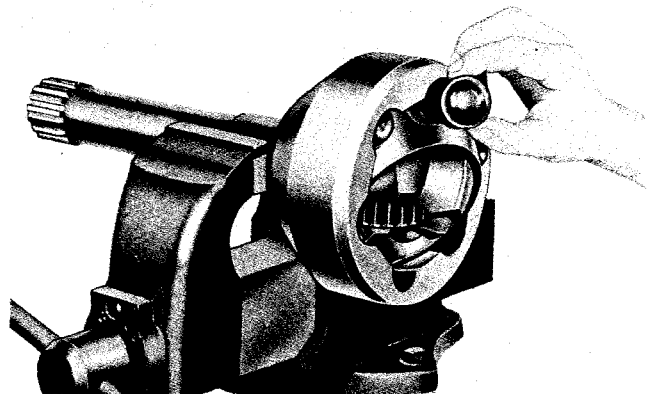
- B. Drive off the shaft, bell, bearing and cage assembly by use of a bronze drift against end of inner race.

CAUTION: Do not strike these hardened steel pieces directly with a steel hammer.

- C. Remove the lock ring and discard. When shaft is reinstalled, a new lock ring should always be used.

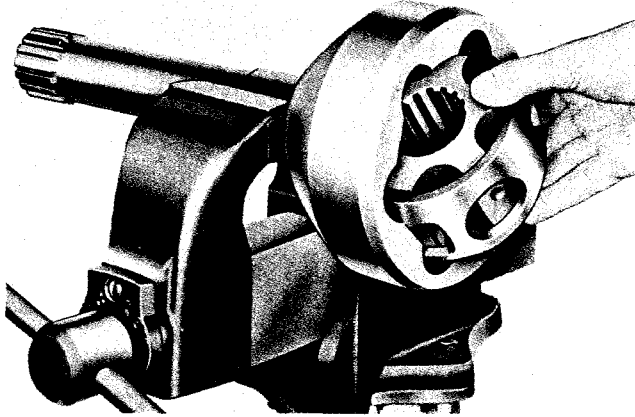
UNIVERSAL JOINT DISASSEMBLY

If universal joints are disassembled for the purpose of cleaning, inspecting or replacing of individual components, use the following procedure:

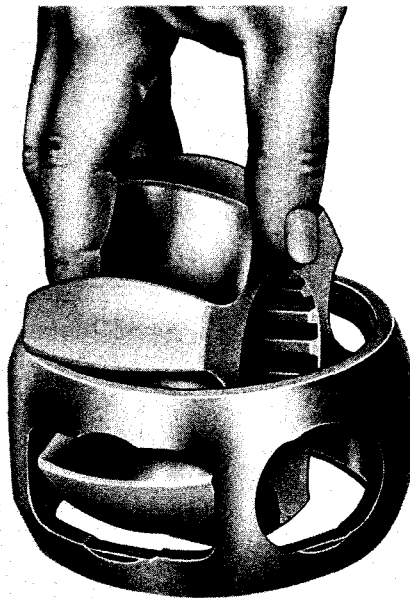


- A. Tilt the inner race in the outer race bell until one joint ball can be lifted out. Then tilt the

inner race until the next ball can be lifted out, continue until all the balls are removed.



B. Roll the cage and inner race at right angles to the outer race bell with the two elongated openings in cage aligned with opposite teeth of bell. Then lift cage and inner race from the outer race bell.



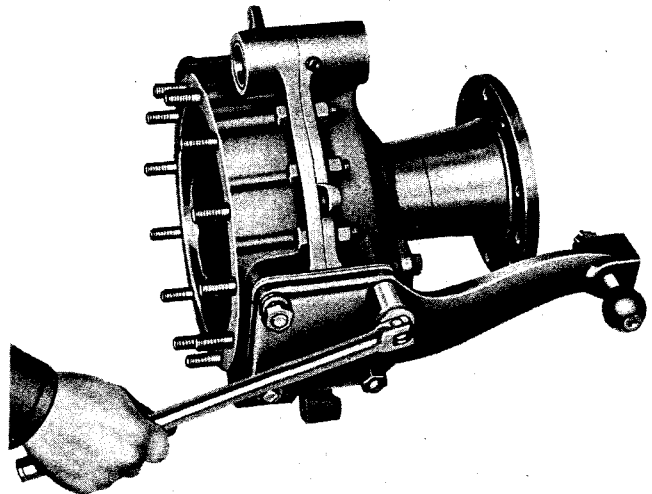
C. To separate the inner race from the cage, turn race at right angle to cage, align tooth on race with elongated hole in cage and roll inner race from cage.

REMOVE TRUNNION SOCKET ASSEMBLY

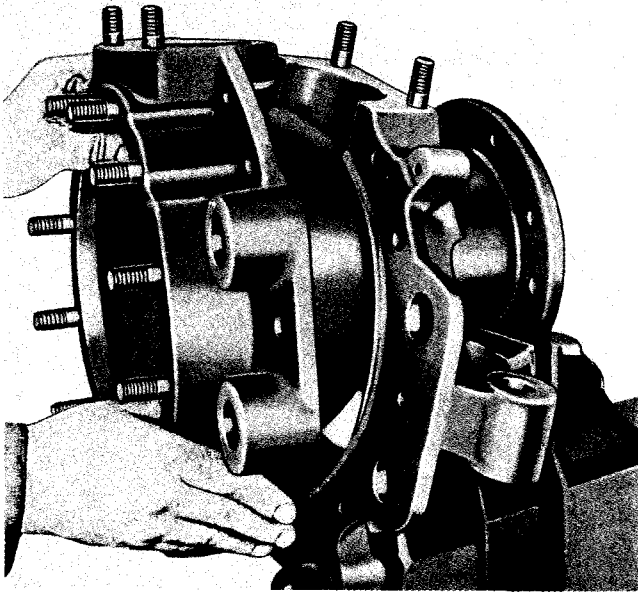
- Disconnect the steering arm linkage.
- Disconnect the tie rod ends at clevis joint.
- Remove dust shields where employed.
- Remove the stud nuts and lock washers from the socket to axle housing flange.
- Separate the trunnion socket assembly from the axle housing.
- The trunnion socket assembly can be placed in a bronze jawed vise for further disassembly.

DISASSEMBLE THE TRUNNION SOCKET ASSEMBLY

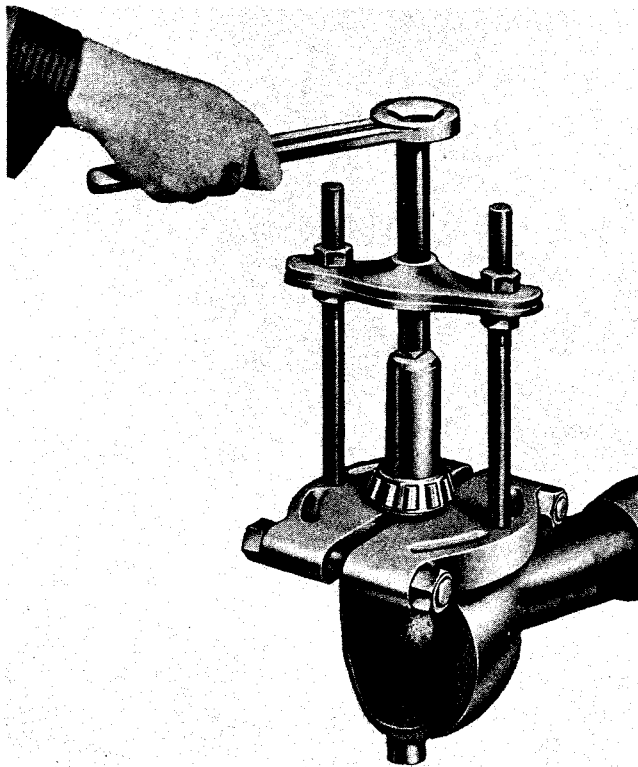
Tapered Bearing Type



- Remove the steering arm stud nuts and lock washers.
- Remove the steering arm and shim pack. Shim pack should be wired together to keep intact to facilitate adjustment on reassembling.
- Remove the lower bearing cap stud nuts and lock washers.
- Remove the lower bearing cap and shim pack. Wire shim pack together to keep intact to facilitate adjustment on reassembling.



E. Remove the bearing cups and separate the knuckle flange assembly. The inner half of knuckle flange may be tipped at an angle to clear inner connecting flange.



F. If bearings are to be replaced, remove the bearings with a suitable puller.

G. Remove the oil seal from the oil seal recess in the housing at connecting flange.

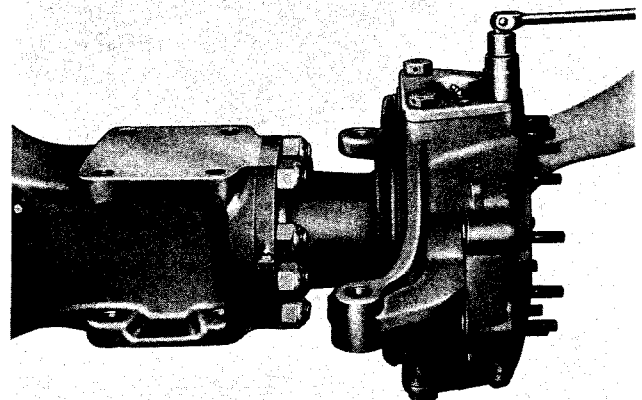
H. Remove the knuckle flange socket felt or oil seal. New felts or seals should always be used in knuckle rebuild.

NOTE: Some models may also incorporate a hardened cover guide plate in front of the oil seal as a seal element protector during the installation and removal of the axle shafts. These guide plates are machined with an interference fit to the housing seal bore. To remove seals on axles that employ these guide plates, it is necessary to drive the plates out by means of a long bar from the opposite end of housing.

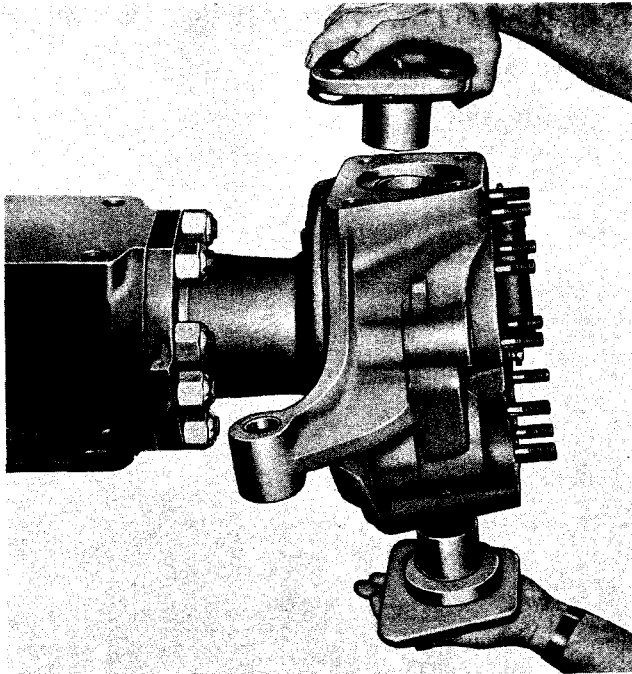
Refer to Rockwell-Standard Field Maintenance Manuals Nos. 5 and 5A for procedure on disassembly and reassembly of single reduction drive units employed in the PR and PS models.

DISASSEMBLE THE TRUNNION SOCKET ASSEMBLY

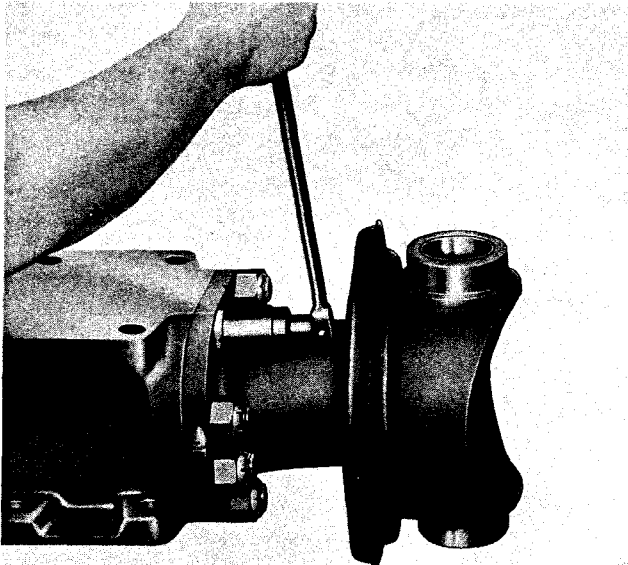
Bronze Bushing Type (PS 250 Type)



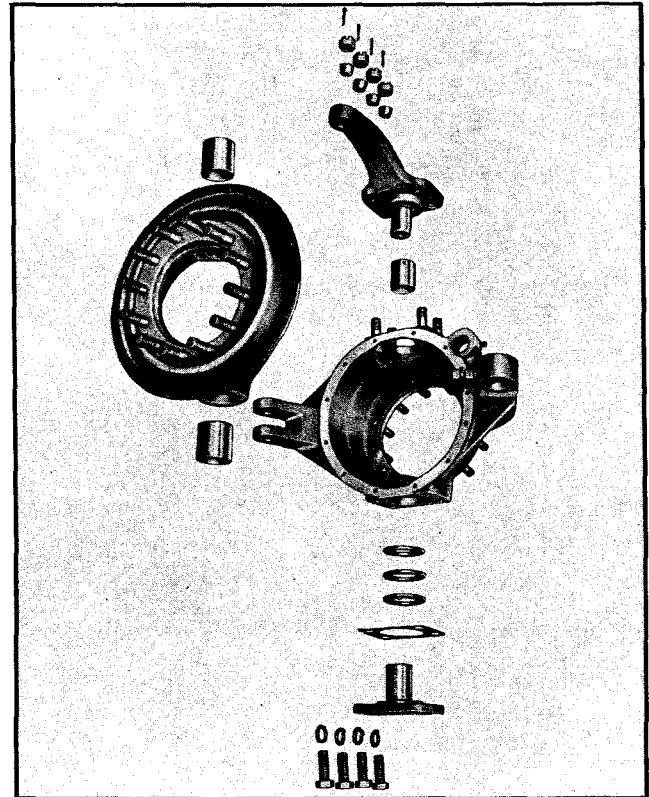
A. Remove the bearing cap cap screws and lock washers.



- B. Remove the upper bearing cap and shims and the lower bearing cap, shims and thrust washers. Keep the shims together for reassembly.
- C. Loosen the outer boot clamp wire and fold back the boot.
- D. Remove the steering knuckle from the socket. The knuckle can be tipped to clear the socket.



- E. Remove the stud nuts at the connecting flange and separate the trunnion socket from the axle housing.
- F. Loosen inner boot clamp wire and remove boot.



PS 310 TYPE KNUCKLE ASSEMBLY

PREPARE FOR REASSEMBLY CLEAN, INSPECT AND REPAIR

Parts having ground and polished surfaces such as gears, bearings, shafts and collars, should be cleaned in a suitable solvent such as kerosene or diesel fuel oil.

GASOLINE SHOULD BE AVOIDED.

Do NOT clean these parts in a hot solution tank or with water and alkaline solutions such as sodium hydroxide, orthosilicates or phosphates.

We do NOT recommend steam cleaning assembled drive units after they have been removed from the housing. When this method of cleaning is used, water is trapped in the cored passage of the castings and in the close clearances between parts as well as on the parts. This can lead to corrosion (rust) of critical parts of the assembly and the possibility of circulating rust particles in the lubricant. Premature failure of bearings, gears and other parts can be caused by this practice. Assembled drive units cannot be properly cleaned by steam cleaning, dipping or slushing. Complete drive unit disassembly is a necessary requisite to thorough cleaning.

ROUGH PARTS

Rough parts such as differential carrier castings, cast brackets and some brake parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts are not ground or polished. The parts should remain in the tank long enough to be thoroughly cleaned and heated through. This will aid the evaporation of the rinse water. The parts should be thoroughly rinsed after cleaning to remove all traces of alkali.

CAUTION: *Exercise care to avoid skin rashes and inhalation of vapors when using alkali cleaners.*

COMPLETE ASSEMBLIES

Completely assembled axles may be steam cleaned on the outside only, to facilitate initial removal and disassembly, providing all openings are closed. Breathers, vented shift units, and all other openings should be tightly covered or closed to prevent the possibility of water entering the assembly.

DRYING

Parts should be thoroughly dried immediately after cleaning. Use soft, clean, lintless, absorbent paper towels or wiping rags free of abrasive material, such as lapping compound, metal filings or contaminated oil. Bearings should never be dried by spinning with compressed air.

CORROSION PREVENTION

Parts that have been cleaned, dried, inspected and are to be immediately reassembled should be coated with light oil to prevent corrosion. If these parts are to be stored for any length of time, they should be treated with a good RUST PREVENTIVE and wrapped in special paper or other material designed to prevent corrosion.

INSPECT

It is impossible to overstress the importance of careful and thorough inspection of drive unit parts prior to reassembly. Thorough visual inspection for indications of wear or stress, and the replacement of such parts as are necessary will eliminate costly and avoidable drive unit failure.

- A. Inspect all bearings, cups and cones, including those not removed from parts of the drive unit, and replace if rollers or cups are worn, pitted or damaged in any way. Remove parts needing replacement with a suitable puller or in a press with sleeves. Avoid the use of drifts and hammers. They may easily mutilate or distort component parts.
- B. Inspect the planetary reduction, planet gears, sun gear and ring gear assembly for wear or damage. Gears which are scored, pitted, ridged or worn should be replaced.
- C. Inspect planetary reduction for the following:
 1. Pitted, scored or worn thrust washers.
 2. Worn or ridged planet pinion pins.
 3. Worn, scored or chipped planet pinions.
- D. Inspect axle shafts for signs of torsional fractures or other indications of impending failure.

REPAIR

- A. Replace all worn or damaged parts. Trunnion sockets if scratched. Replace all hex nuts with rounded corners, lock washers, distorted snap rings, oil seals, gaskets and socket felts at time of overhaul.

Use only genuine Rockwell-Standard parts for satisfactory service. For example, using gaskets of foreign material generally leads to mechanical trouble due to variations in thickness and the inability of certain materials to withstand compression, oil, etc.

- B. Remove nicks, marks and burrs from machined or ground surfaces. Threads must be clean and free to obtain accurate adjustment and correct torque. A fine mill file or India stone is suitable for this purpose. Studs must be tight prior to reassembling the parts.
- C. Tighten all the nuts and cap screws to the correct torque. (See torque limits following service instructions.)
- D. The burrs caused by lock washers at the spot face of stud holes of knuckle flanges, spider flange or hub cover, should be removed to assure easy reassembly of these parts.

REASSEMBLE PLANETARY OUTER END

INSTALL OIL SEAL IN CARRIER HOUSING

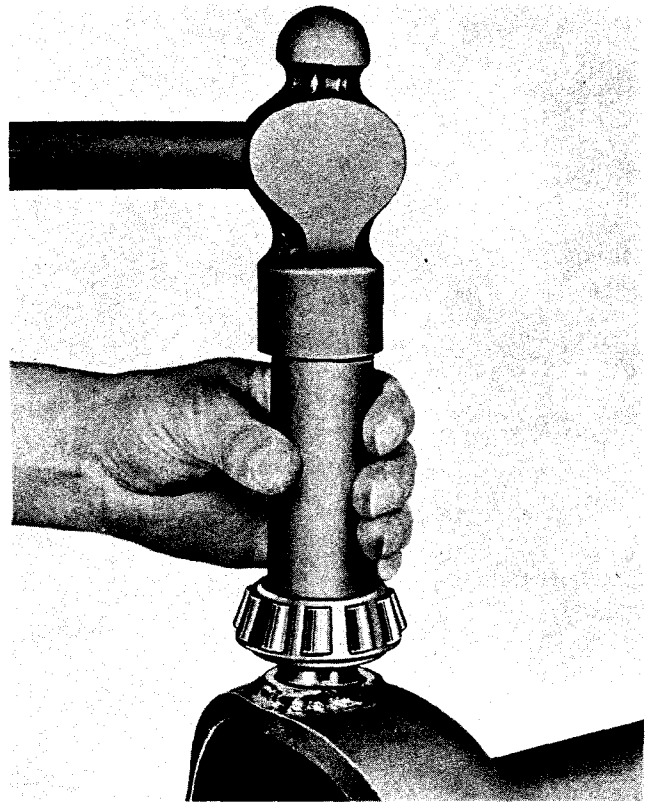
- A. Install oil seal in carrier housing at the connecting flange end with a suitable driver. Care must be exercised to locate the seal squarely against the seal recessed shoulder.
- B. On units incorporating the axle shaft guide plate, start the plate into the end bore evenly with a hammer. Once plate is started square, drive the plate into position with a suitable driver.

CAUTION: Do not strike these hardened steel pieces directly with a steel hammer.

- C. The inner axle shaft oil seals on some planetary models are located in the short bell housing at the connecting flange end. These models employ no axle shaft guide plates and must be installed in the seal bore squarely by use of a proper driver.
- D. On most of the rigid models the spindle and brake spider assembly end is connected to the housing flange by bolts, lock washers and nuts after the oil seal has been properly installed.

INSTALL TRUNNION SOCKET PIN BEARINGS

- A. If trunnion socket pin bearings have been removed, place knuckle pin end of housing in a bronze jawed vise or other suitable fixture.

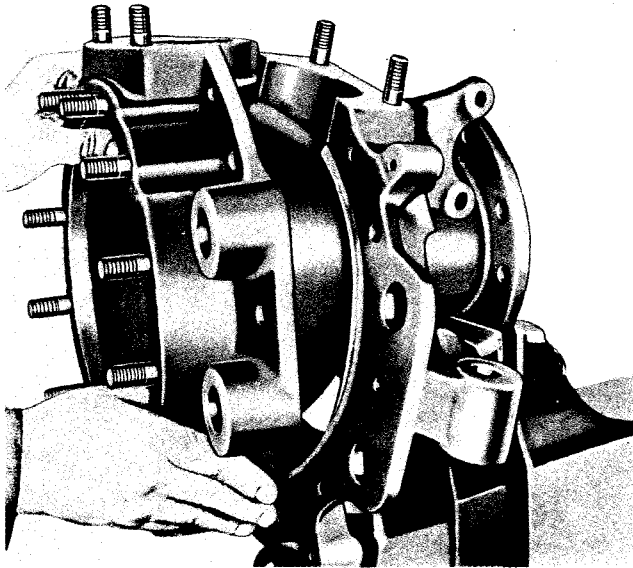


- B. Install the bearing on the knuckle pin by use of a sleeve driver that bears against the bearing inner race.

ASSEMBLE TRUNNION SOCKET ASSEMBLY

Tapered Bearing Type

- A. Assemble by tilting and sliding over the inner end flange of knuckle housing the inner half of knuckle flange.
- B. Install the housing connecting tube bolts, lock washers and nuts.
- C. Tighten nuts to correct specifications as listed on torque chart following service instructions.



- D. Align mating outer knuckle flange with inner knuckle flange.
- E. Join the two flanges together by installing the knuckle flange bolts, lock washers and nuts.
- F. Tighten the knuckle flange nuts to correct torque.
- G. Install the upper and lower bearing cups.

ADJUST STEERING KNUCKLE BEARINGS

- A. Install the original shim packs between steering arm cap and lower bearing cap.
- B. Install the caps, lock washers and nuts.
- C. Tighten the nuts to correct torque and check for end play and oscillating freeness.
- D. The knuckle should be adjusted by adding or removing shims as required.
- E. After zero end play with oscillation has been established, remove a .005" shim from each shim pack.
- F. Replace the caps, lock washers and nuts. Tighten nuts to correct torque. After this is done a small amount of drag in rotating the steering knuckle should be felt, but it should not bind.

- G. The size of the shim pack at the top and the bottom should be nearly the same so as to center the joint assembly for proper shaft alignment.

- H. Install the dust shields where used.

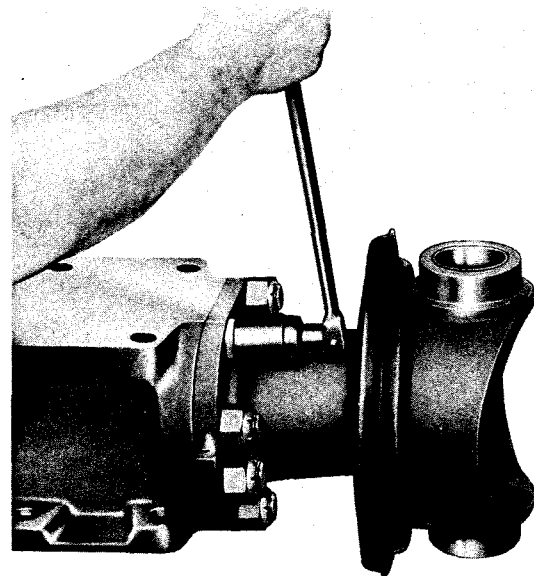
INSTALL TRUNNION SOCKET BRONZE BUSHINGS

Install the bronze bushings with a suitable driver and ream if necessary.

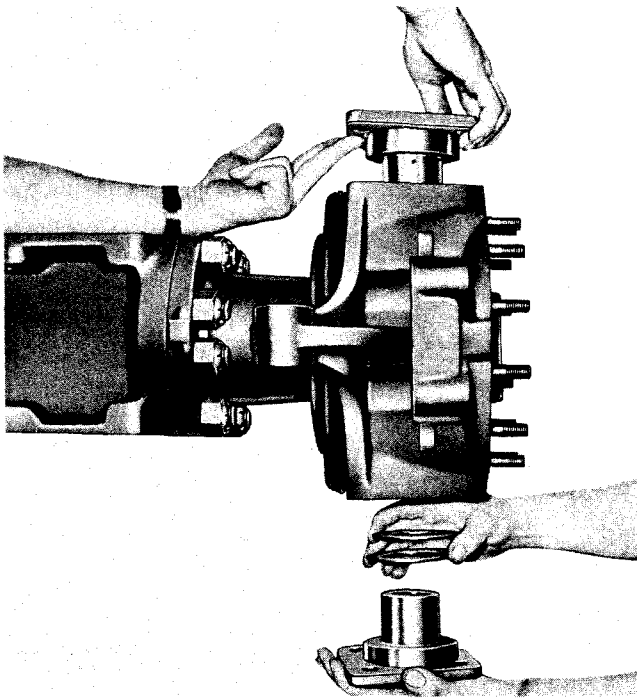
ASSEMBLE TRUNNION SOCKET ASSEMBLY

Bronze Bushing Type

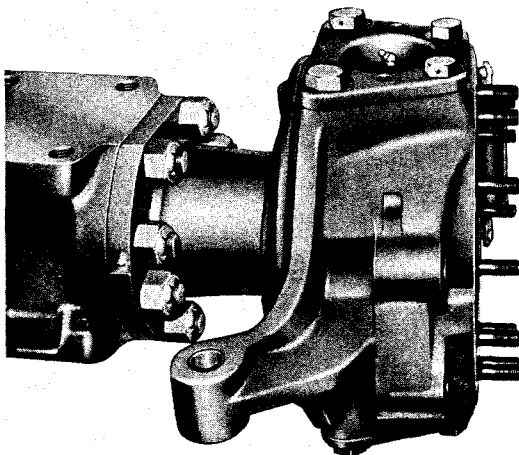
- A. Slip the boot over the connecting flange of the trunnion socket.



- B. Mount the trunnion socket on the axle housing studs and install the stud nuts. Tighten the nuts to specified torque.
- C. Install the inner boot clamp wire in the trunnion socket groove.



- D. Position the steering knuckle over the trunnion socket and install the upper bearing cap and shims. Then install the lower bearing cap, thrust washers and shims.



- E. Install the outer boot clamp wire and tighten the nut.

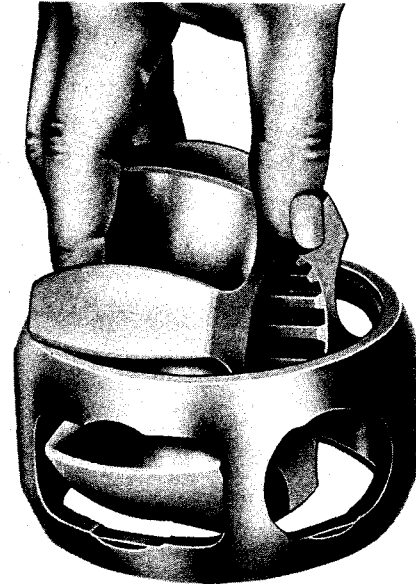
ADJUST STEERING KNUCKLE PRELOAD

Steering knuckle preload can be the shims located under the upper and lower bearing caps. (The adjustment procedure for the tapered bearing type is outlined on page 16.)

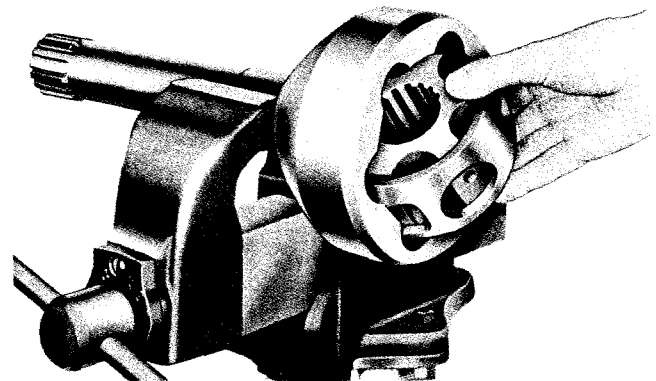
Our recommendation for the bronze BUSHING type steering knuckle is:

Adjust the steering knuckle to .005"-.013" end-play using shims located under the upper and lower bearing caps. The size of both shimpacks should be equalized to center the steering knuckle relative to the drive shaft.

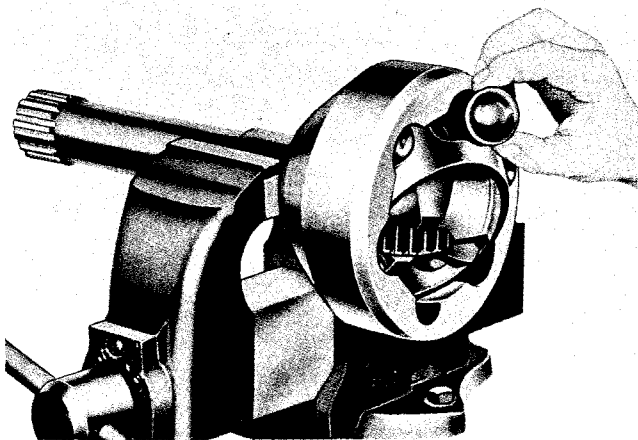
ASSEMBLE UNIVERSAL JOINT



- A. Install the inner bearing race into cage at right angle and align race teeth with elongated cage hole. Turn race within cage to position parallel with cage.



- B. Insert the race and cage into the universal bell at right angle and tilt into position while at the same time aligning bell teeth with elongated openings.



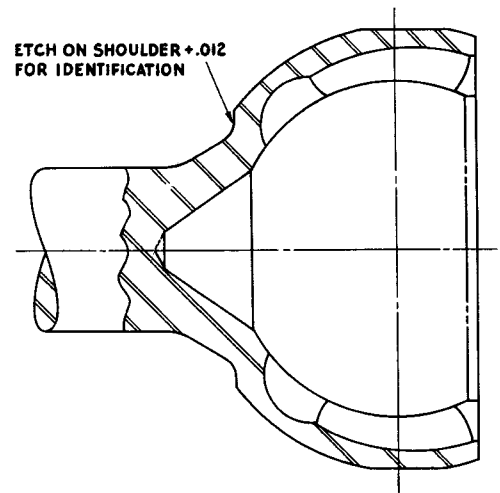
- C. Tilt, in the bell, the inner race and cage until one joint ball can be inserted. Then tilt race and cage with aligning bell teeth until the next joint ball can be inserted. Continue until all the joint balls are in place.
- D. Clamp the outer end of bell shaft in a bronze jawed vise or holding fixture with inner race splines parallel with the bell face.
- E. Install a new locking ring in the inner shaft lock ring groove.
- F. Align the splines of inner shaft with splines of the inner race, holding shaft in a vertical position so that lock ring rests in inner race entering chamfer.
- G. Tap the end of shaft with a rawhide mallet to collapse the lock ring.
- H. Drive the shaft through the inner race until lock ring clears splines and opens, thus locking the shaft in place.

CAUTION: Do not strike these hardened steel pieces directly with a steel hammer.

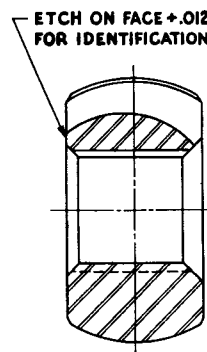
REPLACEMENT OF INDIVIDUAL COMPONENTS IN RZEPPA UNIVERSAL JOINTS

This will acquaint you with the fact that approximately 10% of original Rzeppa universal joints are made with .012" oversize balls, raceways and cages. All original joints that employ oversize com-

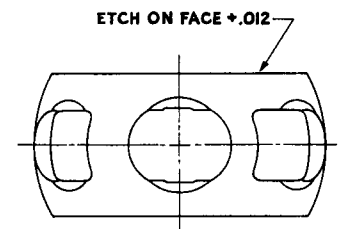
ponents are marked on the individual pieces aside from the balls in the places noted on the following figures:



OUTER RACE BELL



INNER RACE



CAGE

When disassembling these universal joints for the purpose of cleaning, inspecting or replacing individual components, it is advisable to rework them one at a time and thus avoid a chance of mixing parts from standard and oversize assemblies.

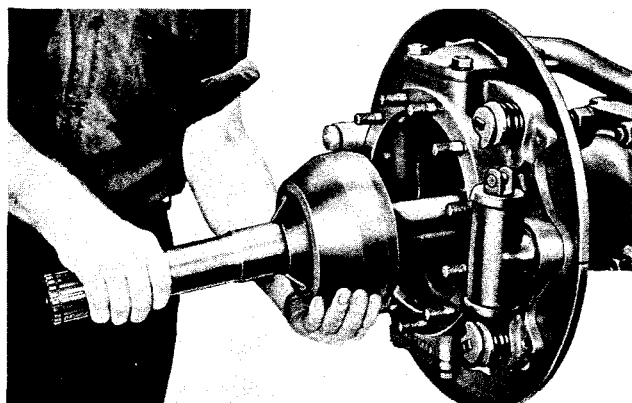
If a considerable number of joints are to be reworked at one time, it will be necessary to segregate the components from standard and oversize joints.

It should be noted further that only standard size components are furnished for service replacement. The standard size parts are to be used for replacement of either standard or oversize parts in the original assemblies. It should be noted, however, that if the outer race, the inner race or the cage in an original oversize joint is replaced, it will also be necessary to replace all the balls at the same time. If the original oversize balls were to be re-used, the resulting assembly would be too tight and would lead to hard steering and short life.

The use of standard size replacement balls in a joint having one or more of the other components oversize, will in no way affect performance or life though there will be slightly more backlash.

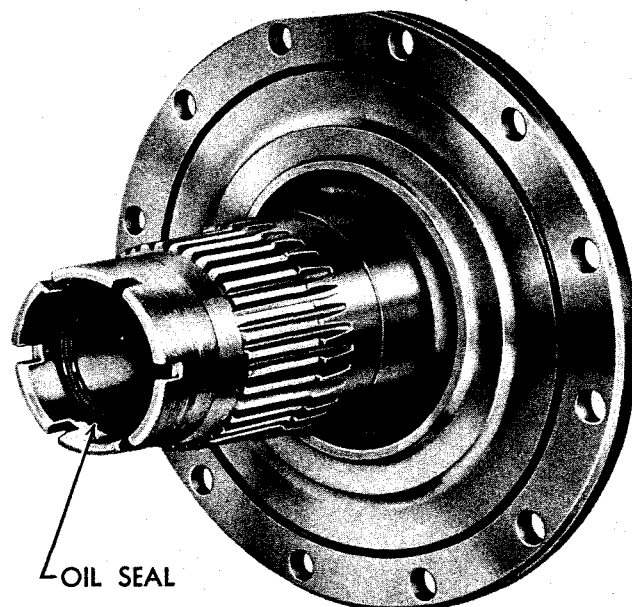
INSTALL AXLE SHAFT AND UNIVERSAL JOINT ASSEMBLY

- A. Hand pack universal joint assembly by forcing grease into bell and race cavities.
- B. Hand pack inner walls of flange socket.

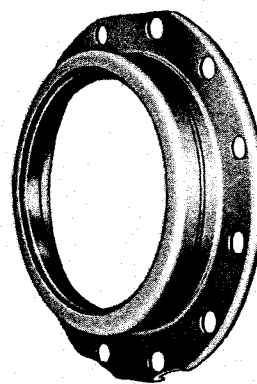


- C. Insert axle shaft through housing and into side gear of drive unit using care not to damage connecting flange oil seal.

INSTALL HUB SPINDLE ASSEMBLY

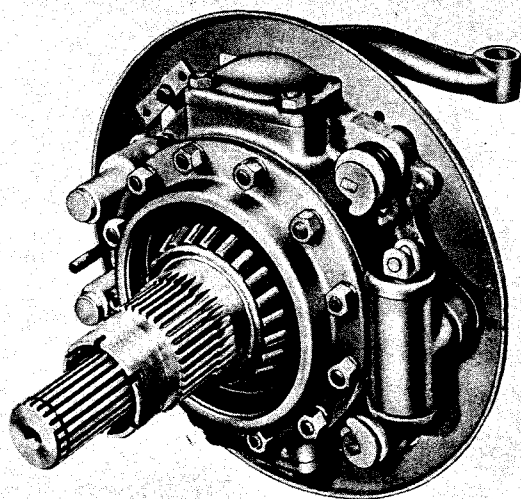


- A. If replacement of the spindle outer oil seal is necessary on PS models, install new seal from outer end with a suitable driver.
- B. Install the inner wheel bearing on the hub spindle.
- C. Position the hub spindle and wheel bearing assembly over the knuckle flange studs.



- D. Place the oil seal and retainer assembly over the studs and install the stud nuts.

Older models use oil seal and retainer assembly which is held in place against the spindle by means of a dowel.



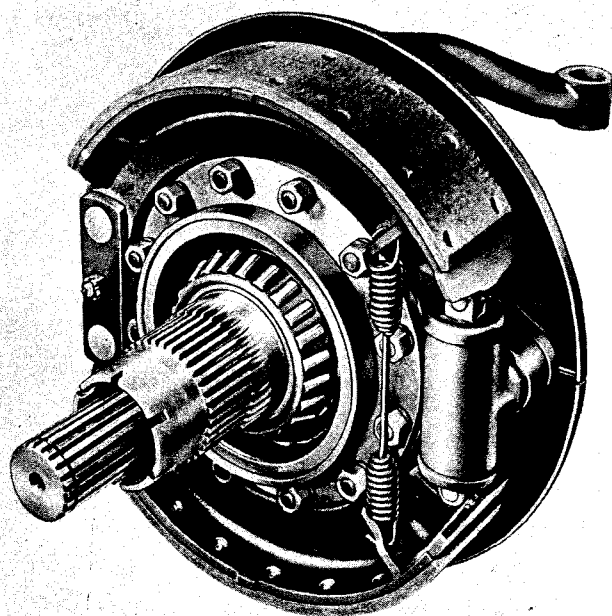
E. Tighten nuts to correct torque.

On PR models join spindle to connecting flange with bolts, lock washers and nuts. Tighten nuts to correct torque.

INSTALL BRAKE ASSEMBLIES

Hydraulic

A. Install brake cylinder and push rods.



B. Install brake shoe and liner assemblies over anchor pins.

C. Install anchor pin plate, nut and cotter key.

D. Align push rods with shoe webs and hook brake shoe return spring.

E. For further detailed information, consult the hydraulic brake section in Field Maintenance Manual No. 4.

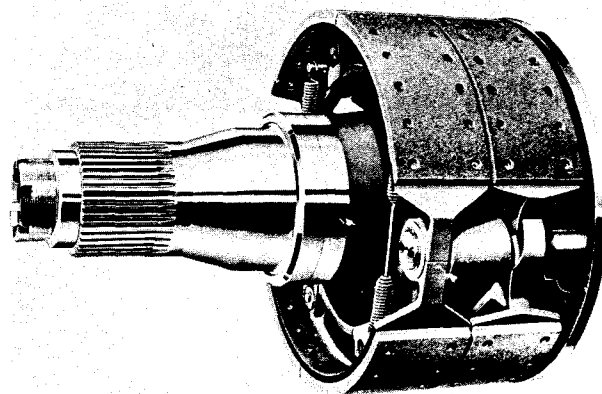
Air Brakes

A. Install cam shaft or shafts, collars, washers, felts and retainers.

B. Install brake shoe and liner assemblies.

C. Hook brake shoe return spring or springs.

D. Install slack adjuster and connect chamber.



E. On larger models using the double brake and double cam, reinstall the inner chamber bracket assembly. Join two-piece cam with splined collar connector.

F. For further detailed information, consult the air brake section in Field Maintenance Manual No. 4.

ASSEMBLE FLOATING RING GEAR ASSEMBLY

A. Install splined ring gear hub into the ring gear splines flush with shoulder.

B. Install the hub to gear connecting plates and cap screws.

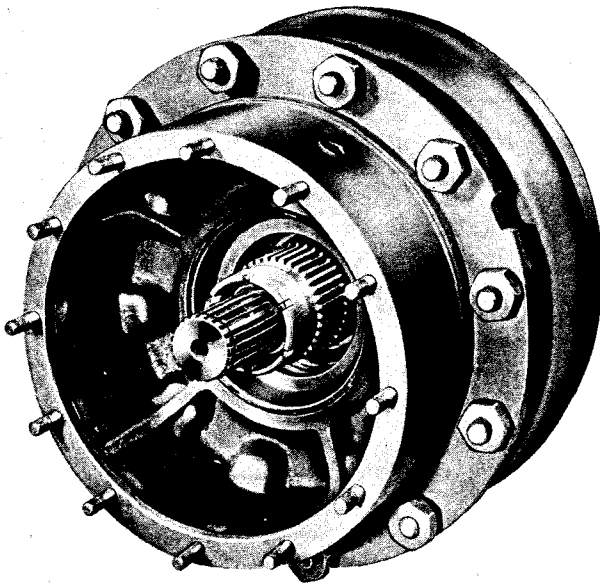
C. Tighten cap screws to correct torque.

D. Lock wire cap screws in sets of two.

- E. Install the outer wheel bearing on ring gear hub journal squarely against hub shoulder. The inner race of bearing is a slide fit over the spindle hub journal.

ASSEMBLE HUB AND DRUM ASSEMBLY AND INSTALL

If hub bearing cups have been removed for replacement, install new cups with a suitable driving sleeve on either PR or PS models.



PS and Smaller PR Models

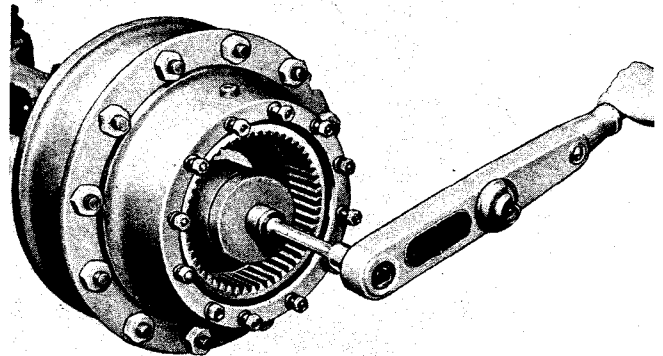
- A. Lift the hub and drum assembly onto the hub spindle and position so that the inner cup rests on the inner bearing rolls.
- B. Install the floating ring gear assembly, while at the same time lifting the weight of the hub and drum assembly to allow the outer bearing to mate with outer hub bearing cup.
- C. Install the wheel bearing adjusting nut.

Larger PR Models

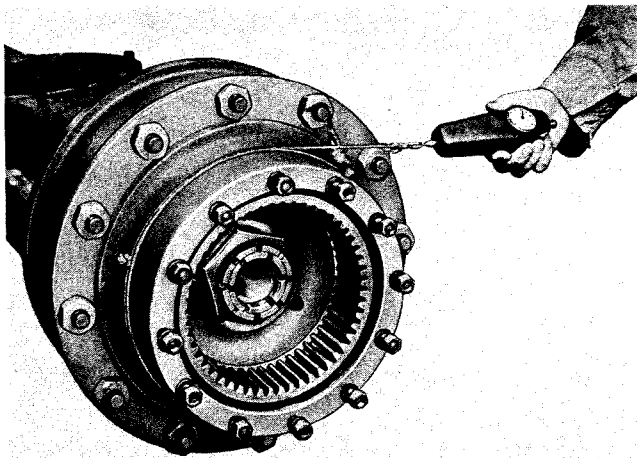
On larger PR models the ring gear assembly and bearing may be temporarily mounted to the hub assembly by cap screws through the puller holes of ring gear hub flange, into the smaller threaded holes of hub spider.

- A. Place hub and drum assembly on floor or bench vertically with brake drum up.
- B. Install rear bearing in cup.
- C. Install seal and retainer with suitable driver.
- D. Invert the hub and drum assembly.
- E. Install the ring gear assembly and outer bearing.
- F. Align ring gear puller holes with hub spider holes.
- G. Install cap screws for temporarily holding the assemblies together.
- H. Supporting the weight by use of chain falls, locate the combined assembly on the hub spindle splines.
- I. Install the wheel bearing nut and draw assembly into position.
- J. Remove the temporary cap screws from the ring gear and hub spider.

WHEEL BEARING ADJUSTMENT



- A. "On axles other than the PR-50 and PS-50 series, tighten the adjusting nut against the ring gear hub to 400 pound feet while the wheel is being rotated. On PR-50 and PS-50 series axles, adjust the nut to 100 pound feet while the wheel is being rotated. Rotate the wheel in both directions to make sure bearings and related parts are fully seated."
- B. Back off adjusting nut $\frac{1}{4}$ turn to relieve preload on bearings.

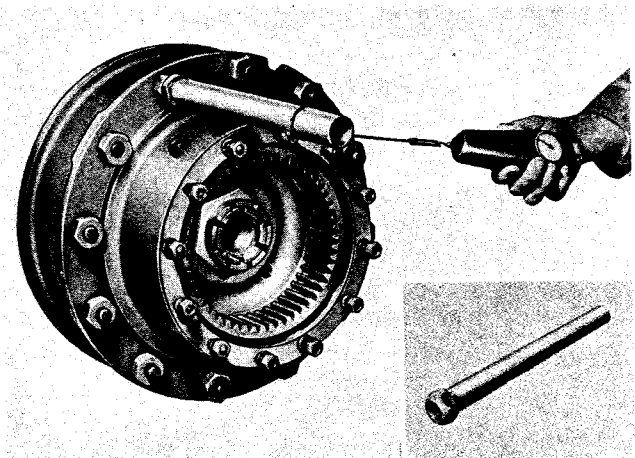


- C. If wheel bearings have been replaced with new bearings, check the rotating torque (not starting torque) by means of a pull scale and cord and advance the adjusting nut in small increments until the proper preload for the particular axle model is obtained as follows:

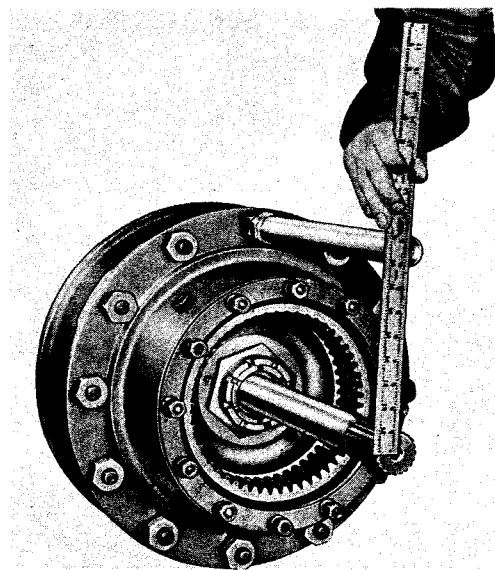
AXLE MODEL	PRELOAD TORQUE
PR-50, PR-60, PS-50	3 to 5 lb. ft.
PR-100, PS-100	4 to 8 lb. ft.
PR-150, PS-150	5 to 9 lb. ft.
PR-200, PS-200	5 to 9 lb. ft.
PR-250, PS-250	6 to 10 lb. ft.
PR-300, PS-300, PR-400	8 to 12 lb. ft.
PR-500, PS-500	10 to 14 lb. ft.
PR-700	14 to 18 lb. ft.

NOTE: The above torque specifications allow for the drag of the hub spindle oil seal. However, if a felt dust seal is used in the inside of the brake drum, the torque specifications should be increased by 5 lb. ft.

If wheel bearings are being reused, they should be put back in same position as before. Advance the adjusting nut in small increments and check rotating torque until an increase is noted. If increase is slight, install nut lock in this position or back off nut enough to install nut lock. If increase is appreciable, back off nut until increase is only slight or none and then install nut lock.



- D. If it is not convenient to remove the wheels of the vehicle, check the wheel bearing preload torque as shown above. The extension (see inset) permits a reading to be taken without interference from the tire.

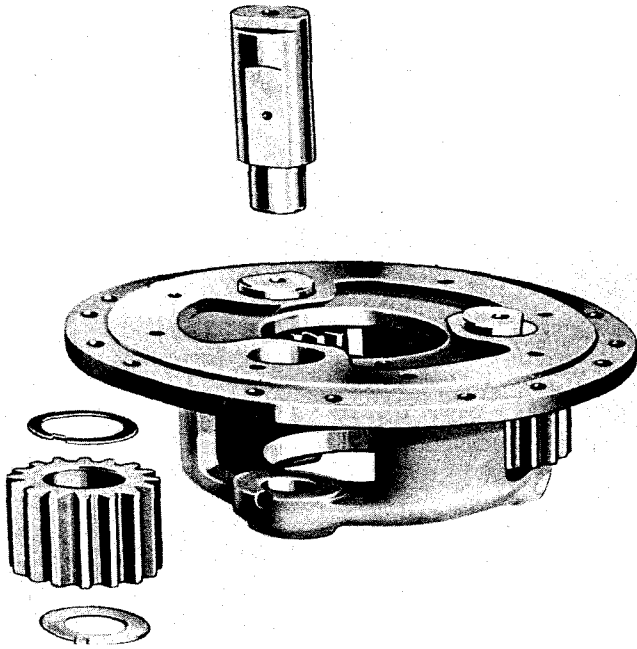


- E. Bearing preload torque is figured by multiplying the radius (the distance from the center of the wheel to the center of the extension) by the reading on the pound scale.

For Example: Assume the distance from the center of the wheel to the center of the extension is 9 inches and the reading on the pound scale is 7 pounds—multiplying 9 inches by 7 pounds, we get 63 pound inches. Since our preload specifications are listed in *pound feet*, we simply divide the 63 pound inches by 12 and arrive at a reading of 5.25 pound feet.

This method of converting pound inches to pound feet also applies to Step "C" above.

ASSEMBLE PLANETARY SPIDER



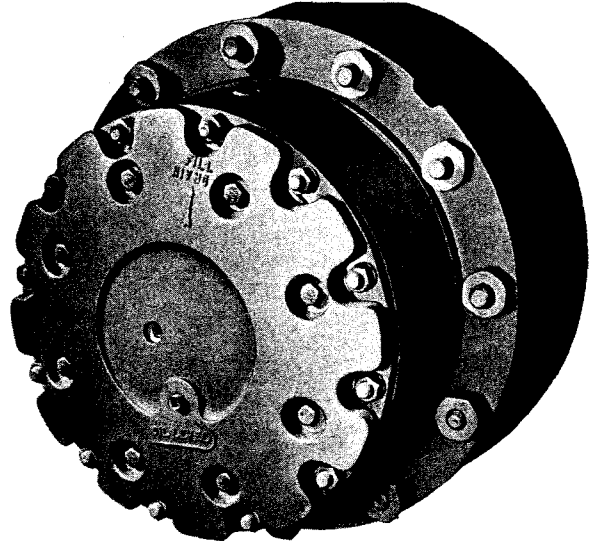
- Place the planetary spider cage on a bench or block up on metal plates.
- Align inner thrust washer hole with planet pin hole so that locating tab of washer lies in spider indent.
- Slide in planet gear and outer thrust washer and align holes.
- Press in the planet pin, small diameter end first.
- Outer end of pins must be turned so that the machined flat is to the outside of hub circle. This not only allows cover clearance but also properly locates the planet pin oiling flat.
- Proceed in the same manner with the second and third sets of planet pinions and thrust washers.
- Planet pins should be pressed through until the shoulder of pin butts thrust washer.

INSTALL SPIDER AND PINION ASSEMBLY

- Install spider to hub gasket after making sure that all hub spider studs are properly seated.
- Start the spider and pinion assembly, aligning teeth of planet pinions with sun gear and ring gear teeth.
- Align hub studs with spider holes and push spider assembly onto studs against hub gasket.
- Install spider lock washers and nuts.
- Tighten nuts to correct torque.

INSTALL COVER

- Install new spider to cover gasket against spider. It will be necessary to hold the gasket in place with a gasket cement so that the gasket hole may be aligned with the spider holes.



- Install the spider cover with cap screws and lock washers. Fill arrow must be in line with hub fill plug.
- Tighten cover cap screws to correct torque.

LUBRICATION

- Turn the complete hub and drum assembly so that the "FILL" plug is at the top.
- Remove the "FILL" plug and the "OIL LEVEL" plug in the cover.
- Fill wheel end planetary hub through "FILL" hole with SAE-90 multi-purpose lubricant until lubricant appears at the "OIL LEVEL" hole. Re-install "FILL" and "OIL LEVEL" hole plugs and tighten securely.

Recommended lubricant for planetary axle outer ends is multi-purpose gear lubricant SAE-90 Rockwell Specification 0-64 for both summer and winter use.

Recommended lubricant for planetary axle carrier drive units is multi-purpose gear lubricant SAE-140 Rockwell-Standard Specification 0-65 or multi-purpose gear lubricant SAE-90 Rockwell-Standard Specification 0-64 as optional, depending on climatic conditions. (See Field Maintenance Manual Number 1 under Multi-Purpose Gear Lubricants.)

CARE AND MAINTENANCE

In low-speed and short-cycle type operation, where the lubricant temperature is likely to stay relatively low, it will usually be possible to use an SAE-90 lubricant in the housing bowl as well as in the wheel ends. In longhaul, sustained-speed type operations where the lubricant temperature is likely to run considerably

higher, it will usually be advisable to use an SAE-140 lubricant in the housing bowl.

Recommended lubricant for planetary steering knuckles is wheel bearing lubricant grease NLGI Grade No. 2.

NOTE: Planetary Axles without oil seals, to separate the wheel ends from the housing bowl, should use S.A.E. 90 (R.S. specification 0-64) lubricants only.

All SPR planetary units should use S.A.E. 90 lubricants (R.S. specification 0-64) in planetary outer ends and S.A.E. 140 (R.S. specification 0-65 as standard and 0-64 as optional) in the housing bowl.

TABULATION OF TORQUE LIMITS

CAP SCREWS									
LOCATION	DIA.	THDS.	TORQUES		LOCATION	DIA.	THDS.	TORQUES	
			MIN.	MAX.				MIN.	MAX.
Planetary spider cover	7/16"	14	53	67	Brake chamber bracket	5/8"	11	160	205
	1/2"	13	81	104		3/4"	10	290	370
Steering bearing cap	1/2"	13	81	104	Brake drum to hub	5/8"	11	160	205
	5/8"	11	160	205		3/4"	10	290	370
	7/8"	14	510	655		7/8"	14	510	655
Planetary ring gear lock	5/16"	24	21	27		Brake cam shaft collar	1"	14	780
	3/8"	16	33	43	1/2"		13	81	104
	7/16"	14	53	67					
BOLTS AND STUD NUTS									
LOCATION	DIA.	THDS.	TORQUES		LOCATION	DIA.	THDS.	TORQUES	
			MIN.	MAX.				MIN.	MAX.
Planetary spider to hub	1/2"	13	81	104	Tie rod clamp	1/2"	20	92	118
	3/4"	10	290	370		5/8"	18	185	235
Steering knuckle to flange	7/16"	14	53	67	Tie rod ball	3/4"	16	320	415
	9/16"	12	116	149		1"	14	780	1000
	3/4"	10	290	370		1 1/8"	12	1120	1420
Spindle to housing	5/8"	18	185	235		1 1/4"	12	1540	1975
	7/8"	14	510	655		1 1/4"	18	1620	2065
	1"	14	780	1000	Steering arm ball	3/4"	16	320	415
Steering arm and steering bearing cap	1/2"	13	81	104		1"	12	780	1000
	5/8"	11	160	205		1 1/8"	12	1120	1420
	3/4"	10	290	370		1 1/4"	12	1540	1975
	7/8"	14	510	655	1 1/4"	18	1620	2065	
Trunnion socket to housing	9/16"	12	116	149	Steering knuckle companion flange	1/2"	13	81	104
	3/4"	10	290	370		1/2"	20	92	118
	7/8"	14	510	655	Carrier to housing	7/16"	14	53	67
				1/2"		13	81	104	
				5/8"		11	160	205	

Torques given apply to parts coated with machine oil; for dry (or "as rec'd") parts increase torques 10%; for parts coated with multi-purpose gear oil decrease torques 10%. Nuts on studs to use same torque as for driving the stud.