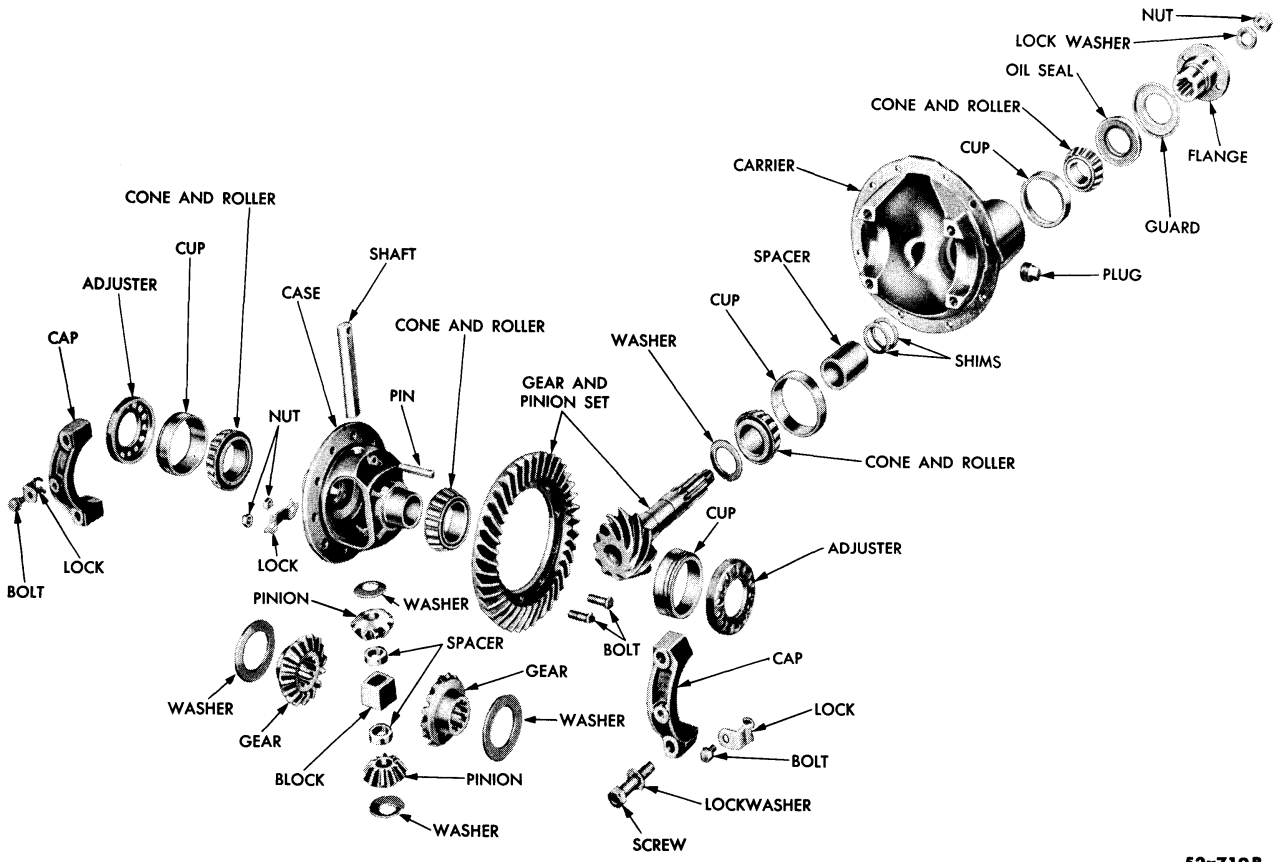


Figure 1—Rear Axle 6 Cylinder—8¼ inch Ring Gear

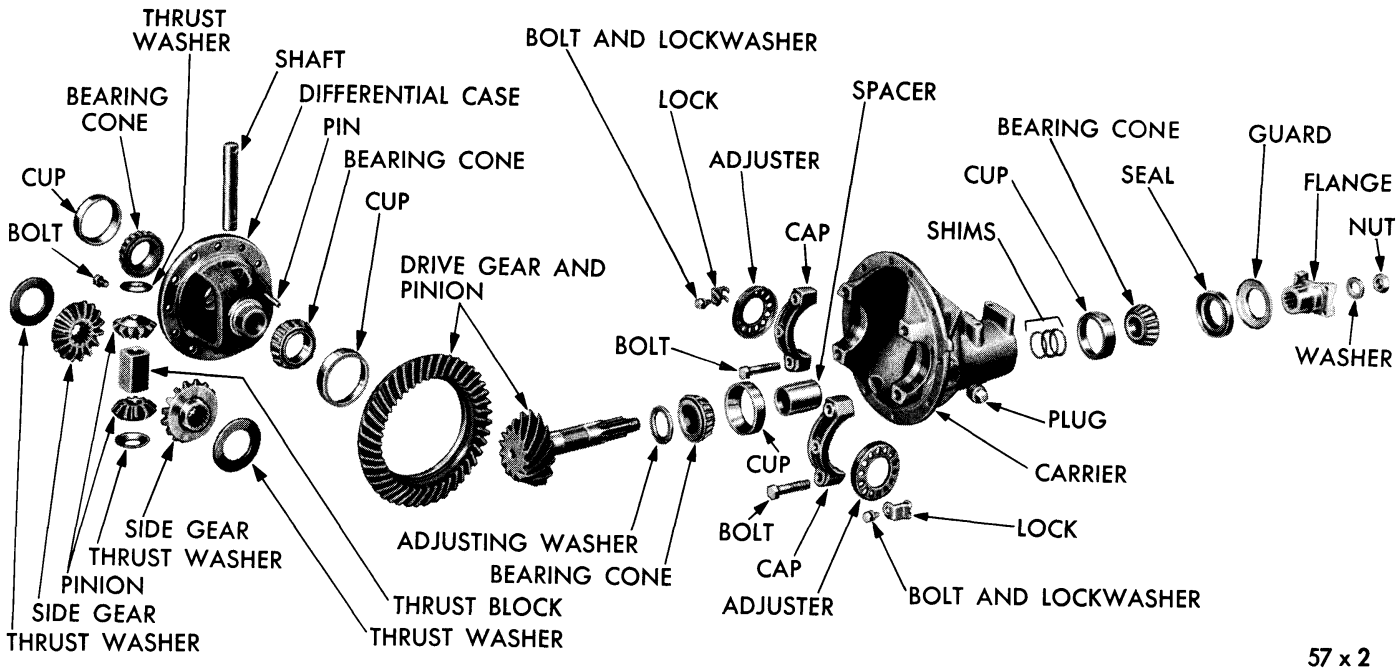


Figure 2—Rear Axle V-8—8¾ inch Ring Gear

PART ONE—CHASSIS

SECTION II—REAR AXLE

1. GENERAL INFORMATION

The rear axle assemblies used on the new Plymouth are of the 2 pinion semi-floating type, as shown in Figure 1 or 2.

The differential, drive pinion and axle shafts are carried on adjustable taper roller bearings. The ring gear is mounted on the differential case flange by special alloy steel bolts. In order to insure quiet, smooth operation, the ring gear and pinion are serviced only in matched sets.

The splined ends of the axle shafts engage in the differential side gears. The outer ends of the axle shafts are tapered and are provided with keyways for attaching the rear wheel hubs, which are supported by adjustable tapered roller bearings pressed on the axle shafts. Side thrust from the wheels is transferred from one shaft to the other by the medium of a thrust block located in the center of the differential case.

NOTE

Cleanliness and inspection are vital factors to remember when overhauling or repairing a rear axle assembly.

Always clean all parts after disassembly and keep them clean throughout assembly. Metal chips, or particles of grit and dirt that may drop into the lubricant, will cause excessive wear and eventually result in failure of the axle.

Always inspect all parts before assembly and replace those that are worn or scored. Remove any burrs, nicks, scratches or rough spots on mating surfaces of replacement parts, caused by rough handling.

2. DIFFERENTIAL AND CARRIER

REMOVAL

Raise the car and remove the rear wheels, hub and drum assembly, using wheel puller Tool C-845.

CAUTION

Do not strike the end of axle shaft to loosen the hub; otherwise, possible damage to the axle shaft bearings and thrust block might result.

Block the brake pedal so it cannot be depressed. Disconnect the brake line at the wheel cylinders, then remove the rear axle drive shaft key, the brake and dust shield.

Remove the shims from each end of the axle housing. Each set should be kept separate so that at reassembly, the central location of the axle, shafts, wheels and thrust block will be assured. Then remove the axle shafts and bearings from the housing, using puller Tool C-499. If necessary, remove the bearings from the axle shafts, using bearing puller Tool C-293-13. See Figure 3.

Remove the rear axle inner oil seals, using puller Tool C-637. Disconnect the rear universal joint and drop the propeller shaft. Remove the bolts that hold the carrier assembly to the axle housing, then lift out the carrier assembly.

REAR AXLE

DATA AND SPECIFICATIONS

Models		P-30	LP-1	P-31	LP-2	
					318 cu. in.	350 cu. in.
Type		Semi-Floating				
Drive Gear Type		Hypoid				
Ratios	Conventional	3.73	3.73	3.54	3.54	3.73
	Optional—Mountains and hilly country	4.1	4.1	3.9	3.9	—
	Overdrive	4.1	4.1	3.9	3.9	—
	PowerFlite	3.73	3.73	3.54	3.31	—
	Optional—Mountains and hilly country	3.9	3.9	3.73	3.73	—
	TorqueFlite	—	—	3.36	3.18	3.31
Ring Gear		8¼ in.	8¼ in.	8¾ in.	8¾ in.	8¾ in.
Ring Gear to Drive Pinion		.006 to .008 in.				
Differential Case Run-Out		0 to .003 in.				
Differential Side Gear Clearance		0 to .008 in.				
Axle Shaft End Play		.013 to .018 in.				
Drive Pinion Bearing Preload		20-30 in. lbs. without seal				
Lubricant Capacity		3¼ pts.	3¼ pts.	3½ pts.	3½ pts.	3½ pts.

TORQUE SPECIFICATIONS

Axle Shaft Nuts	145 ft. lbs. (min.)
Rear Axle Ring Gear Bolt Nuts	40 ft. lbs.
Differential Bearing Cap Screws	85 to 90 ft. lbs.
Drive Pinion Flange Nut	240 to 280 ft. lbs.

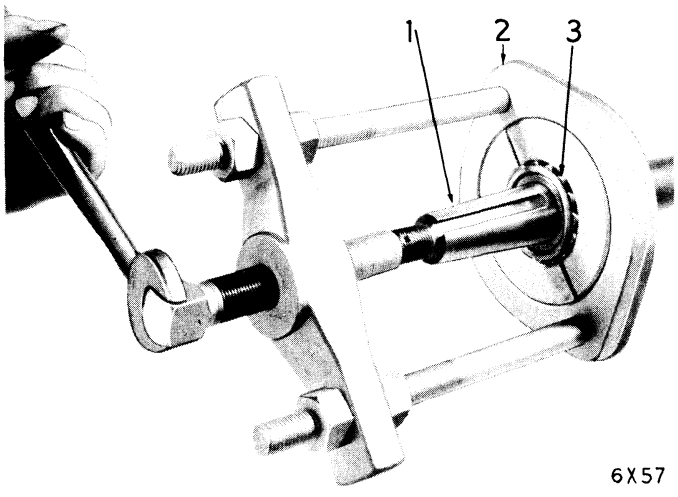


Figure 3—Removing Bearing from Axle Drive Shaft (Puller C-293-13)

3. CARRIER DISASSEMBLY

Check gear tooth pattern before disassembling the carrier assembly, refer to Figure 1. With the carrier assembly mounted in stand, mark both the differential bearing adjusting nuts and caps. See Figure 4.

NOTE

The caps must not be interchanged as they are line bored with the carrier housing at manufacture.

Remove the companion flange retaining cotterpin, nut and flat washer. See Figure 5. Using puller Tool C-452, and flange holding Tool C-784, remove the companion flange. See Figure 6.

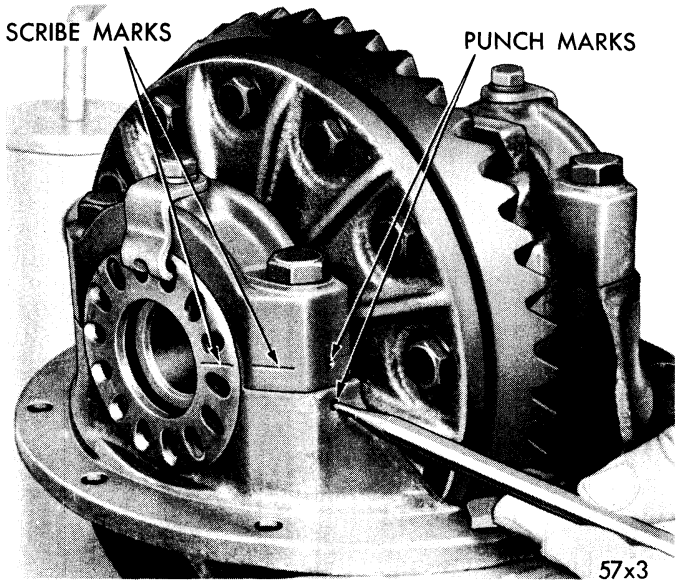


Figure 4—Marking Bearing Caps and Nuts Before Removal

Insert Pinion shaft oil seal puller Tool C-748 into seal and remove from housing. See Figure 7.

Remove the pinion bearing oil slinger, bearing cone, pre-load shims and spacer then remove the adjusting nut locks and loosen the differential bearing cap retaining bolts and adjusting nuts to relieve the load on the bearings. Remove the caps and adjusting nuts.

Lift the differential assembly out then remove the differential bearing cups from the bearings. Slide the drive pinion out through the gear end of the differential carrier. If necessary, remove the rear bearing from the pinion shaft, using puller Tool C-293. See Figure 8.

NOTE

When using Tool C-293, be sure and use number 36 plates.

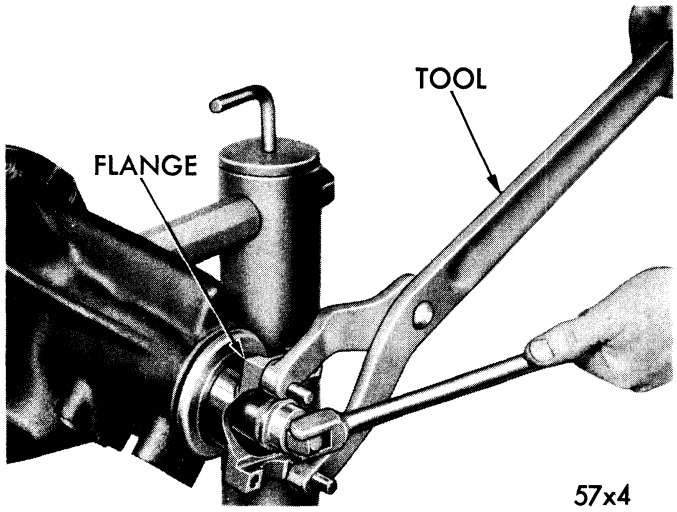


Figure 5—Removing or Installing Companion Flange Nut

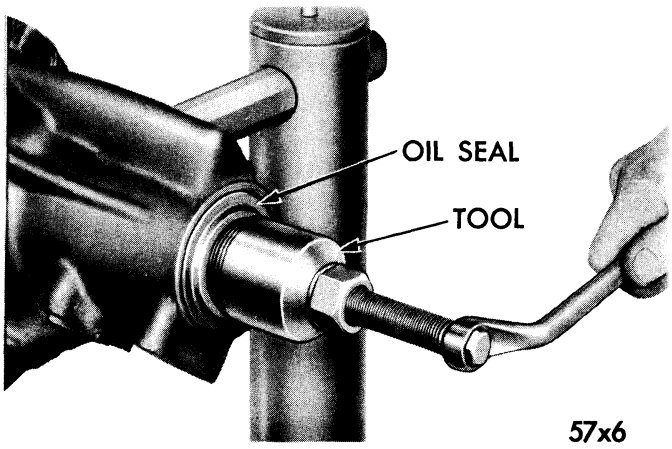


Figure 7—Removing Drive Pinion Bearing Oil Seal

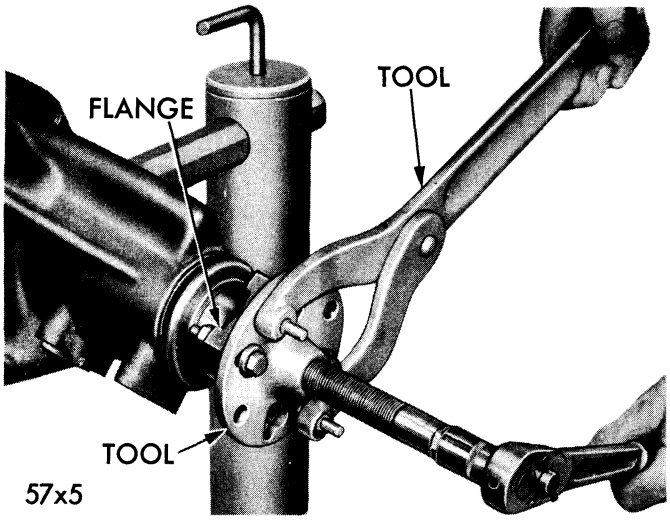


Figure 6—Removing Companion Flange

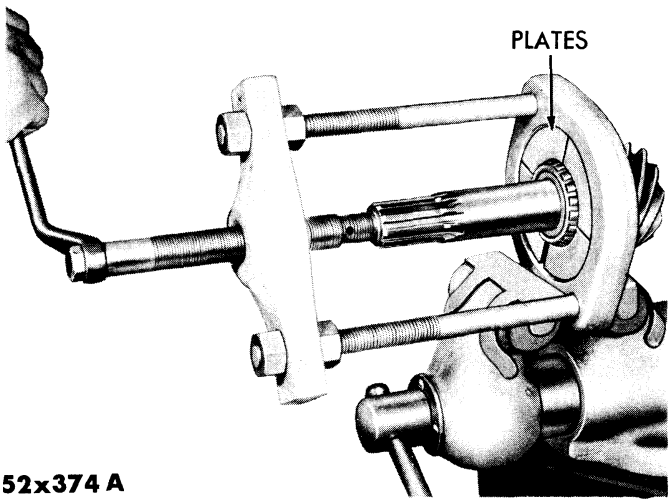


Figure 8—Removing Bearing from Pinion

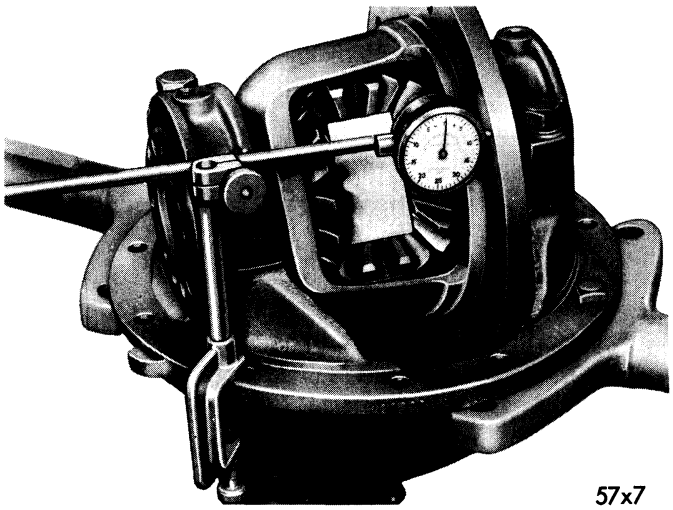


Figure 9—Checking Ring Gear Mounting Flange Run-out

If necessary, remove both bearing cups from the carrier housing, using a suitable drift. Place a drift alternately in the two machined slots, in order to drive the cups out evenly.

4. DIFFERENTIAL

DISASSEMBLY

Remove the bolts which attach the ring gear to the differential case. (Bolts are left hand thread on 8¾" ring gear). Tap the ring gear off the case flange, using a fibre hammer.

1. DIFFERENTIAL CASE—Mount the differential case in the carrier and remove excessive play from the bearings with the adjusting nuts. Now, mount a dial indicator on the carrier mounting face and check the ring gear mounting flange run-out, as shown in Figure 9. Run-out should not exceed .003 inch.

Inspect the bolt holes in the ring gear mounting flange for wear or out-of-round. If the bolt holes are out-of-round, the ring gear will creep on the case.

Remove the differential case from the carrier. Fit number 18 plates behind bearings and then pull off the differential bearings using Tool C-293. See Figure 10. (Number 27 plates 6 cylinder.)

Remove the differential pinion shaft lockpin by driving out of the case using a hammer and punch, as shown in Figure 11.

Drive the differential pinion shaft out of the differential case, using a brass drift and hammer. Lift out the rear axle drive shaft thrust block. Rotate the pinion gears 90° away from pinon shaft hole and remove from case, as shown in Figure 12, then lift out the differential side gears and thrust washers.

2. DIFFERENTIAL PARTS—Check the bearings for roughness, or brinelling. The bearings must run free and show no indication of roughness or wear.

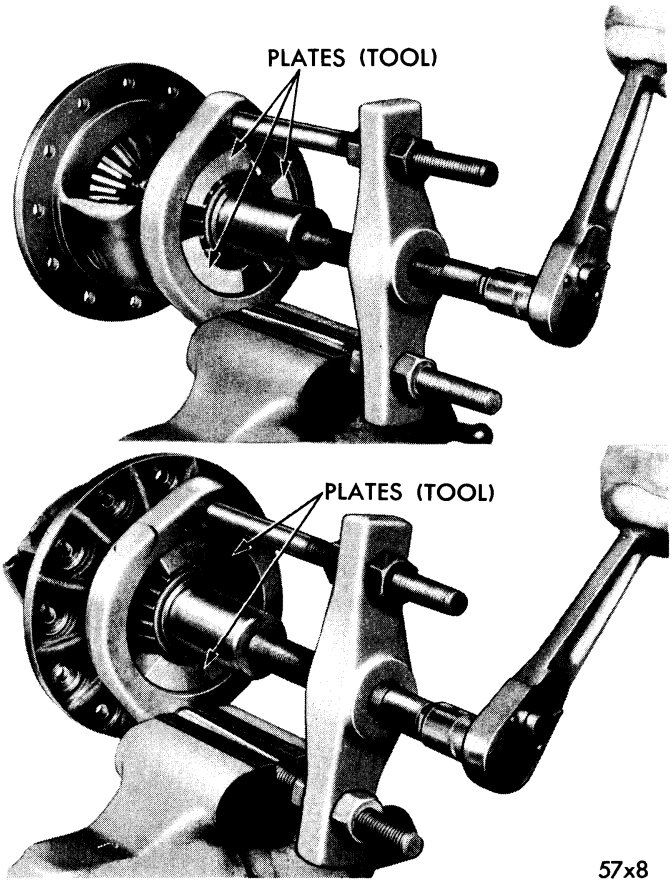


Figure 10—Removing Differential Bearings

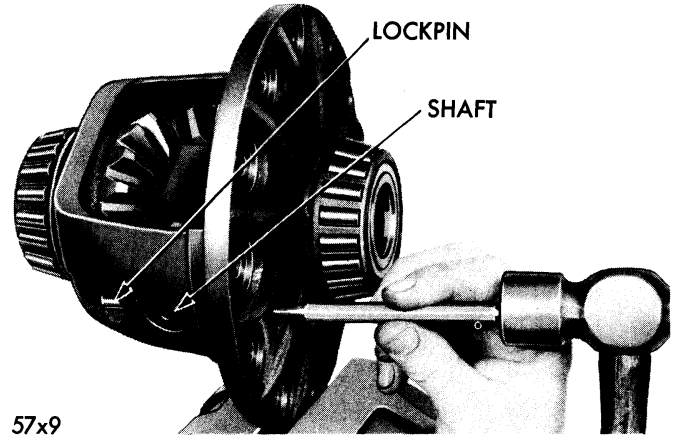


Figure 11—Removing the Differential Pinion Shaft Lockpin

Examine the bearing cups for pitting, scoring or wear. Inspect all gears for chipped or worn gear teeth. Check the fit of the differential side gears on the axle shaft splines and the differential gears on the pinon shafts. Check the thrust washers for wear.

Inspect the axle shafts for twists; the splines for wear, cracks or distortion. Any evidence of the above conditions will necessitate the installation of new parts.

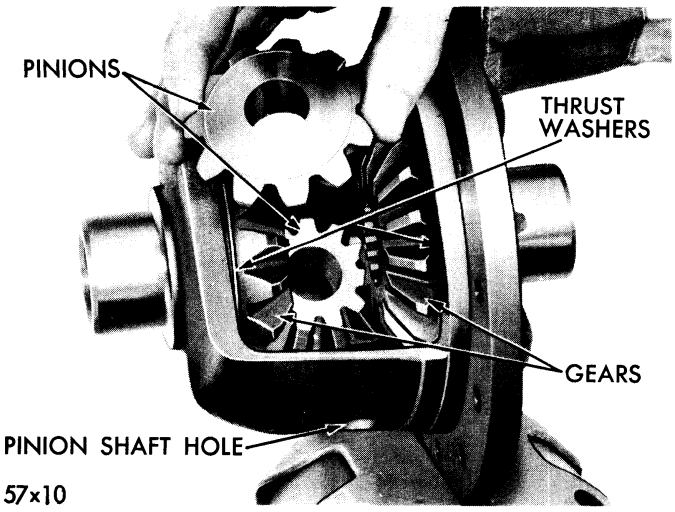


Figure 12—Removing or Installing Differential Gears and Washers

ASSEMBLY AND ADJUSTMENT

If new differential side gears are to be installed, place a new thrust washer over the hub of each gear and install in position in the differential case. Slide new thrustwashers over the differential side gears and place in position in case. Insert pinion gear in case and with teeth meshed, rotate side gears until pinion gear is at bottom. (Refer to Figure 12.) Install remaining pinion gear so that the teeth mesh and pinion shaft hole in each gear is in perfect alignment (gears 180° opposite).

Rotate complete gear cluster and at the same time, insert the pinion gear washers (between gear and case). Continue to rotate gear cluster until gear shaft holes and case holes are aligned.

Coat all parts with Hypoid Gear Oil, then continue to assemble the differential. Line up the locking pin hole in the pinion shaft. Slide pinion shaft into hole in case and into pinion gear. Install the spacer block with elongated portion of hole toward side gears. Continue to slide shaft through block, opposite gear and into case until end of shaft is flush with case.

Install the pinion shaft locking pin in the case and drive in place. Peen the metal of the case over pin to hold pin in place then install the ring gear on the flange, then place (locking tabs in position 6 cyl.) and install the gear retaining bolts. Tighten the bolts from 35 to 40 foot-pounds.

Place a differential bearing in position on the hub. Using Tool DD-1005, to drive the bearing down into position. See Figure 13. Install other bearing in like manner.

Place the differential bearing cups over the bearings, then install complete assembly in the carrier housing. Seat the adjusting nuts in the pedestals of the carrier housing, then install the caps and bolts.

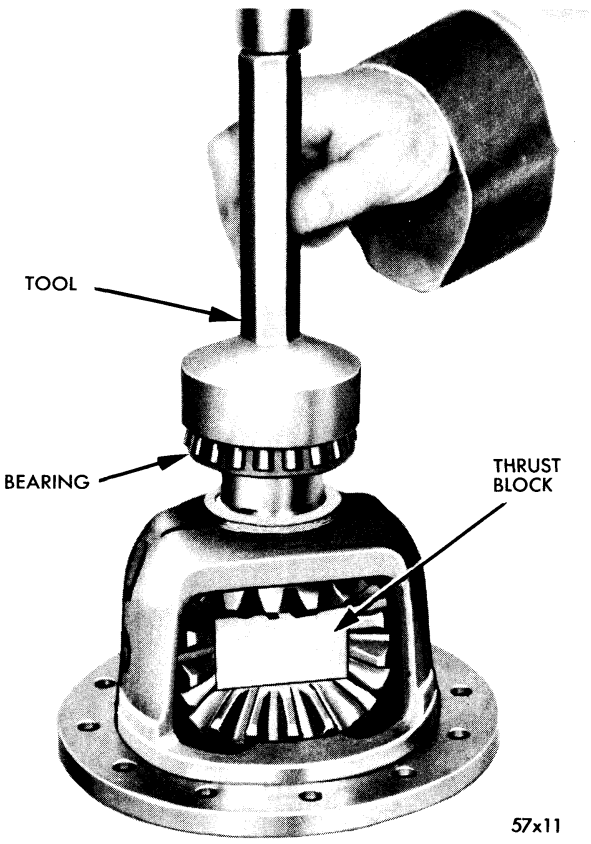


Figure 13—Installing Differential Bearings

> **NOTE**
>
> ***Be sure the caps are on the same side from which they were removed.***

Mount a dial indicator with the pointer resting against the back face of the ring gear and check the run-out. Run-out should be true within .004 inch total indicator reading.

5. REAR AXLE ADJUSTMENT

To set the ring gear and pinion for quiet operation and long life, the following adjustments must be made in the order indicated.

(1) Pinion bearing pre-load.
(2) Pinion setting.
(3) Differential bearing pre-load.
(4) Backlash between ring gear and pinion.

DRIVE PINION BEARING CUP INSTALLATION

Place the bearing cups in position in the carrier. With the bearing cups in position, assemble Tool C-758-D2. Place the rear pinion bearing over the main screw of tool and inserting into carrier from the gear side. Now, place the front pinion bearing over the main screw, followed by adaptor SP-535, washer SP-534 and nut SP-533, as shown in Figure 14.

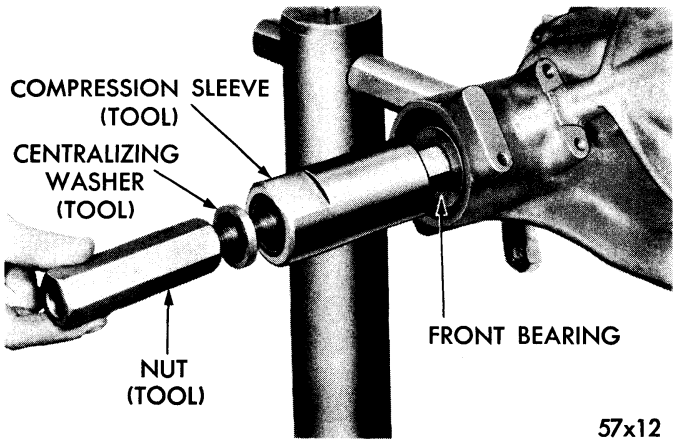


Figure 14—Compression Sleeve and Centralizing Washer in Position

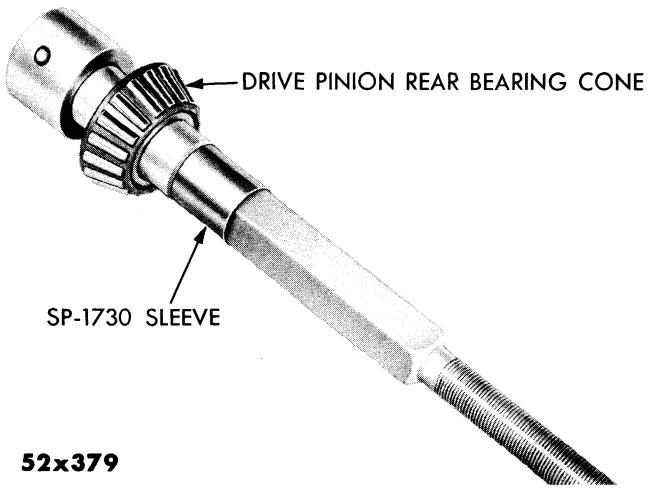


Figure 16—Installing Bearing on Tool

Press the bearing cups into place by tightening the tool nut. See Figure 15. Allow the Tool to rotate slightly in order not to damage bearings or cups during this operation.

PINION BEARING PRE-LOAD ADJUSTMENT

The importance of correct pinion bearing pre-load cannot be over-emphasized.

The selection of washers to give the desired pre-load should be carefully made.

When pinion bearings are installed without pre-loading, the cones are not drawn far enough into their cups to bring the rollers in full contact with the thrust ribs on the cones. Bearings installed in this manner would allow the pinion to "walk" backward and forward under operating loads. This causes a variation in tooth contact pattern, resulting in excessive wear and scoring of gears, and usually is accompanied by noise.

On the other hand, where the pinion bearing cones are drawn too far into their cups, the bearings are overloaded even before they have to withstand operating loads imposed upon them by the gears. They are apt to "burn up" under a driving load—the rollers might score the cups, causing bearings to gall or flake, resulting in premature axle failure.

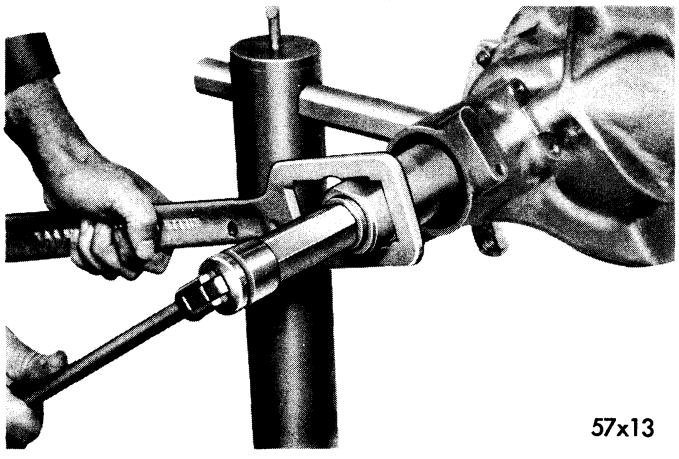


Figure 15—Seating Bearing Cups in Carrier Housing

Correct cone distance is obtaining by the use of a spacer and washer combination. Do not install the pinion oil seal during the pre-load and pinion setting operations, otherwise, there will be an added drag on the pinion shaft which would give a false bearing pre-load reading on the torque wrench.

To check and adjust the pinion bearing pre-load, coat the drive pinion bearings with differential lubricant (multi-purpose SAE 90). Assemble the drive pinion shaft rear bearing on the main body of Tool C-758-D2, as shown in Figure 16.

Slide SP-1730 sleeve, drive pinion bearing spacer and bearing adjusting shims over tool and then insert the assembly into the carrier. Slide the front pinion bearing over the tool and down into position in the bearing cup. Now, slide compression sleeve SP-535 and centralizing washer over tool and slide down into position, as shown in Figure 14. Install the compression nut, tighten the tool nut with a torque wrench from 180 to 200 foot-pounds. See Figure 17.

Turn the tool with a speed wrench to permit the bearings to seat. After the bearings have seated, check the bearing pre-load by revolving the tool with an inch-pound torque wrench. With the bearings lubricated with hypoid gear oil, the pre-load should read from 20 to 30 inch-pounds. See Figure 18.

A bearing adjustment that does not meet specifications, it will be necessary to change the shim pack. Use a thicker shim pack if the pre-load is above 30 inch-pounds or a thinner shim pack if the pre-load is below 20 inch-pounds. After the correct pre-load has been obtained, leave the tool in position in the carrier with the compression nut tightened at 180 to 200 foot-pounds. This is necessary to obtain the correct pinion setting.

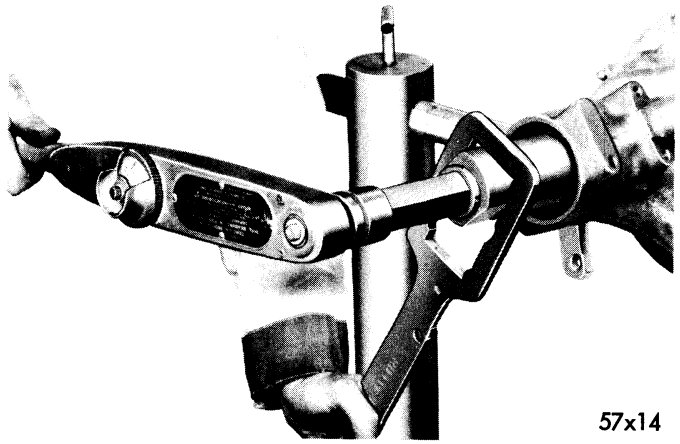


Figure 17—Tightening Compression Nut with Torque Wrench

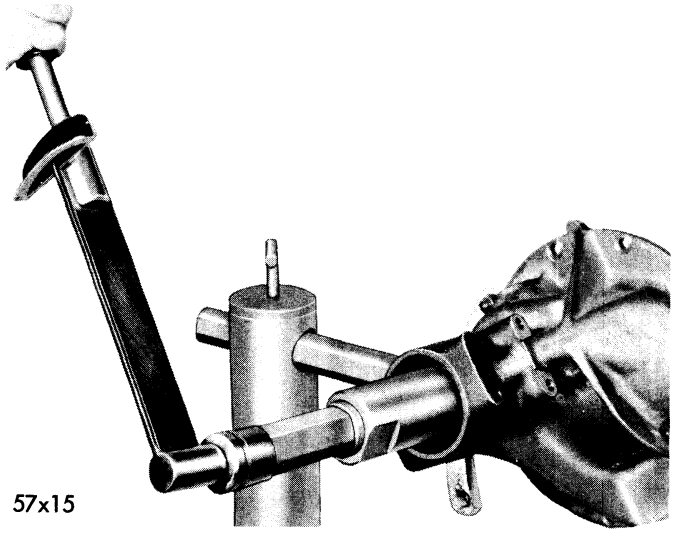


Figure 18—Checking Preload Torque (Inch-Pounds)

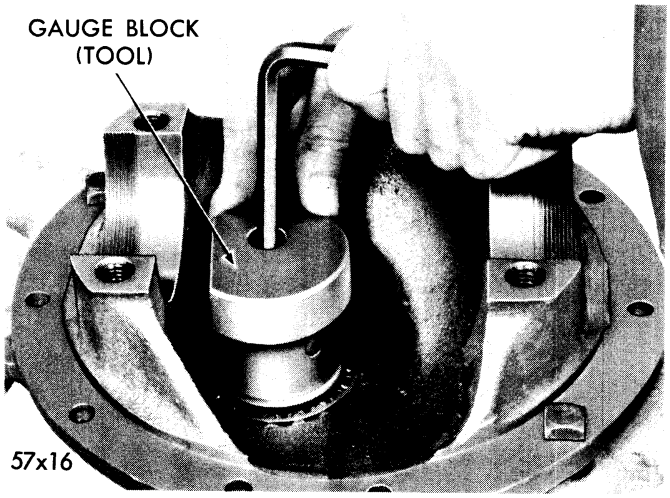


Figure 19—Installing Gauge Block on Tool

6. PINION SETTING

When replacing a ring gear and pinion, remember that they are matched and lapped in pairs. The position in which the best tooth contact is obtained is etched on the end of the pinion shaft.

The pinion is generally etched with a plus (+) or minus (—) sign, followed by a number (ranging from 1 to 4), or it may be marked zero (0).

If the old and new pinions have the same markings, the old washer may be used providing new bearings and cups are also used. If the pinion being replaced is marked zero (0) and the new pinion to be installed is marked plus two (+2), a thinner washer may be used. If the new pinion were marked minus two (—2), a thicker washer could be used. Pinion marked plus (+) generally use a thinner washer while pinion marked (—) use a thicker washer.

Pinion spacer washers are available in nine different sizes.

WASHER THICKNESS

.084 in.	.094 in.
.086 in.	.096 in.
.088 in.	.098 in.
.090 in.	.100 in.
.092 in.	

Fasten the gauge block SP-528 to the rear of the tool, as shown in Figure 19. Tighten the set screw securely. (SP-528 takes the place of the drive pinion during the setting operation.)

Place SP-561 arbor, in the differential carrier bearing supports, see Figure 21. Assemble the bearing caps and bolts to the carrier housing. Tighten the bolts to 10 foot-pounds. Before installing the arbor, remove any burrs or upsets in the bearing bores. Any foreign material in the bores will not allow the arbor to seat properly.

The distance represented between the gauge block and the arbor determines the thickness of the spacer

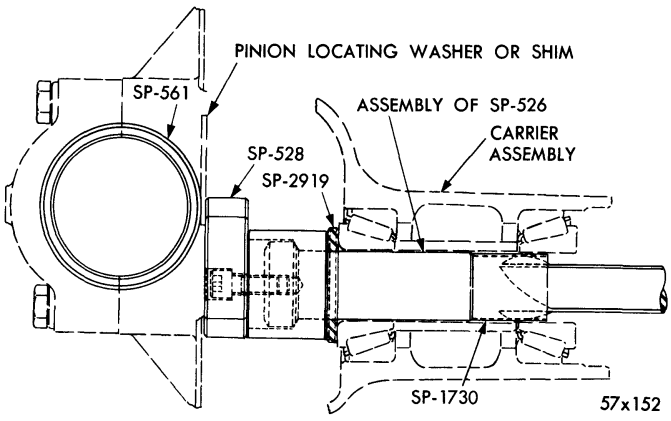


Figure 20—Setting Pinion Bearing Pre-load with Tool C-758-D2-3

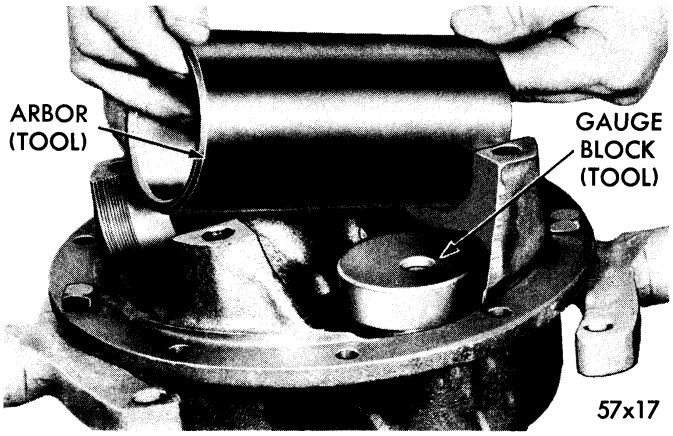


Figure 21—Installing Arbor SP-561

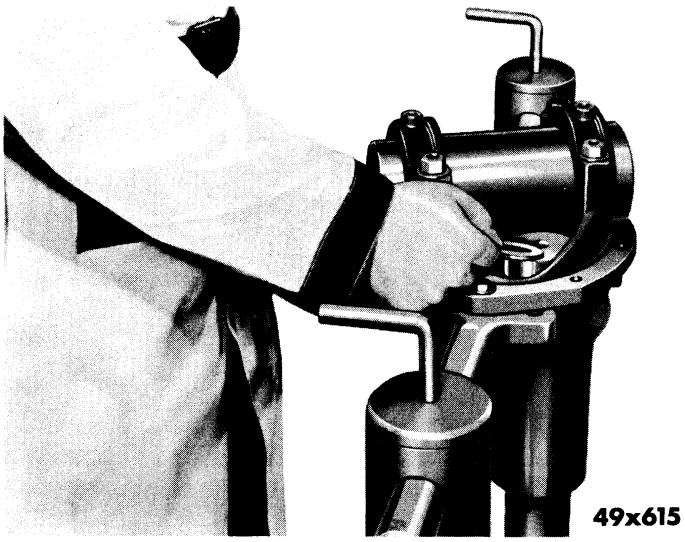


Figure 22—Determining Spacer Washer Thickness

washer that should be used to give the correct pinion setting. Select a pinion washer of sufficient thickness that will just pass between the arbor and the gauge block. See Figure 22.

For an example, if a .090 inch washer can be inserted but a .092 inch washer cannot be forced between the two surfaces by hand, the .090 inch washer should be used, even though it might feel loose.

Check the end of the drive pinion as it may indicate the amount that should be added or subtracted from the washer that was selected in the above mentioned check.

As an example, if the mark on the pinion shaft indicates +2, a .002 inch thinner washer should be used for the final assembly. If a spacer selected by the use of the tool is .090 inch, it is necessary to deduct .002 inch, therefore, the correct washer for final assembly would be .088 inch.

When the correct washer has been selected for the drive pinion, disassemble the tool from the differential carrier housing.

7. CARRIER ASSEMBLY

Slide the previously selected washer over the pinion shaft and down against the machined surface of the drive pinion. Now, slide the rear bearing down over the pinion shaft and press into position using Tool DD-996 and an arbor press.

Slide the bearing spacer over pinion shaft, followed by the shim pack selected during preload operation. Insert the drive pinion, bearing, spacer and shim pack into the differential carrier housing. Be sure the bearings are coated with Hypoid gear oil. Slide the front bearing over the pinion shaft and down into position in the cup, then install the bearing oil slinger.

Install a new oil seal over the pinion shaft and drive into position, using Tool C-359, as shown in Figure 23.

NOTE

When installing new leather oil seals, care must be taken to make certain the leather is in good condition, soft and pliable. New seals should be soaked in thin oil for about 30 minutes, then work the leather by rolling with a smooth bar, before installing. Synthetic seals require no preparation except initial lubrication.

Install the companion flange on the pinion shaft, using Tool C-496. Install the companion flange retaining washer and nut. Hold the companion flange with Tool C-784, and tighten the nut from 180 to 200 foot-pounds.

Place the differential bearing cups over the bearings, then install complete assembly in the carrier housing. Seat the adjusting nuts in the pedestals of the carrier housing, then install the caps and bolts. Be sure the caps are on the same side from which they were removed.

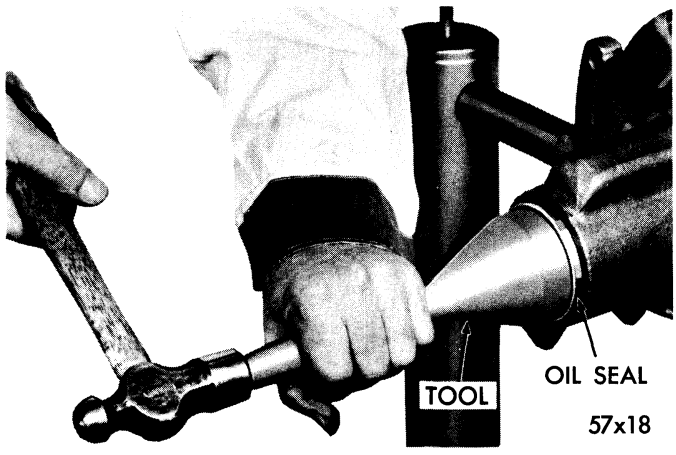


Figure 23—Installing the Drive Pinion Oil Seal

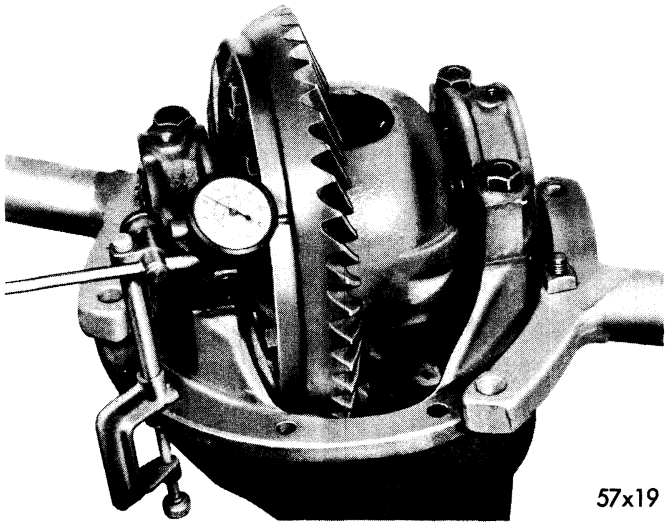


Figure 24—Checking Ring Gear Run-out

Mount a dial indicator with the pointer resting against the back face of the ring gear and check the run-out. Run-out should be true within .004 inch. See Figure 24.

8. DIFFERENTIAL BEARING PRE-LOAD AND BACKLASH

Make certain the bearings and cups are seated by rotating the ring gear with the adjuster tight enough to remove the play. Mount a dial indicator with the pointer resting against the back face of the ring gear and check the run-out. Run-out should be within .004 inch. See Figure 24. If run-out is excessive, check for dirt, or burrs which may prevent the ring gear from seating on the case.

Using spanner wrench C-406A (Figure 25) screw out the bearing adjuster at the rear face of the ring gear and screw in the opposite adjuster until considerable backlash exists between the ring gear and the pinion.

Tighten the lower pedestal bolts to 85 to 90 foot-pounds, leaving the top bolts slightly loose. This holds the bearing cups in line while moving the ring gear. Screw out the adjuster on the tooth side of the ring gear. This adjuster must not touch bearing cup until opposite side is completely set up. Mount a dial indicator on the differential housing so the plunger rests against one of the ring gear teeth as shown in Figure 26. (Make certain that the indicator is properly positioned so that the plunger will accurately indicate the exact amount of backlash.

Check the backlash between the ring gear and pinion at 90° intervals as the gear is rotated. Locate the point of least backlash and screw in the adjuster at the back of the ring gear until only .001 inch of backlash exists between the ring gear and pinion. Move the adjuster slightly if necessary to install the nut lock and bolt. Tighten upper pedestal bolts to 85 to 90 foot-pounds.

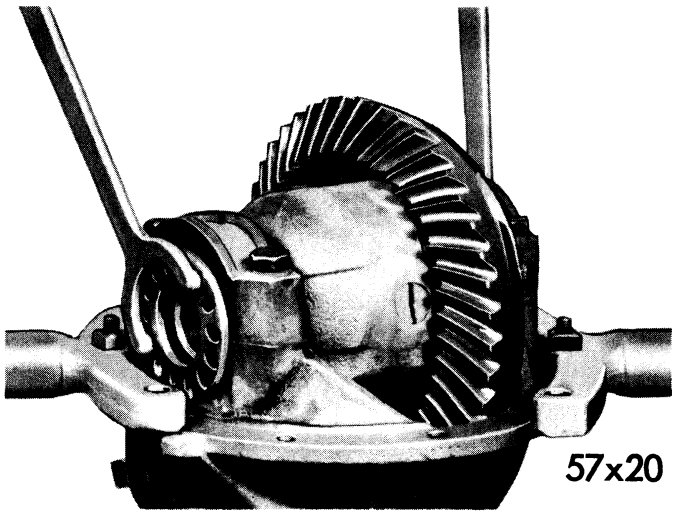


Figure 25—Adjusting Differential Bearings

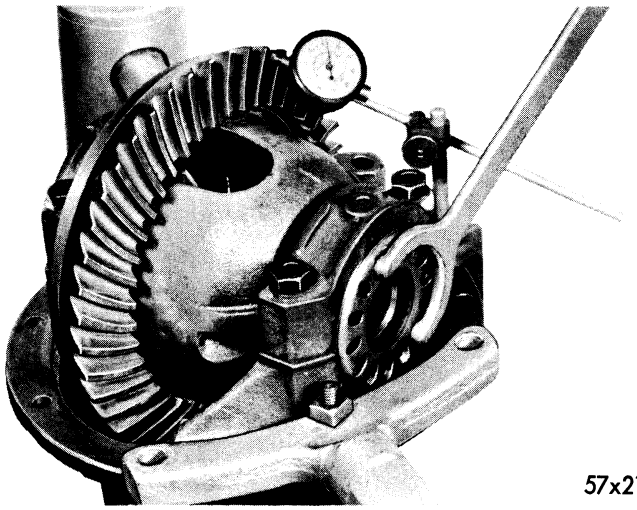


Figure 26—Checking Backlash Between Ring Gear and Pinion

NOTE

In order to properly pre-load the bearings, the entire procedure must be very carefully performed. Therefore, it is important to end up with .001 inch clearence between the ring gear and the pinion before the upper bolt is tightened.

Screw in the adjuster at the tooth side of the ring gear until the dial indicator shows .006 inch backlash. Considerable efforts will be required to turn the adjusting nut the last notch or two, however this is necessary to insure the proper pre-load. Install nut lock and bolt and tighten upper pedestal bolt to 85 to 90 foot-pounds. Recheck the other three pedestal bolts. After final tightening of all pedestal bolts, recheck the backlash. As a result of this method of adjustment, the carrier pedestals have been spread and the differential bearings pre-loaded; and the backlash between the ring gear and

46x255

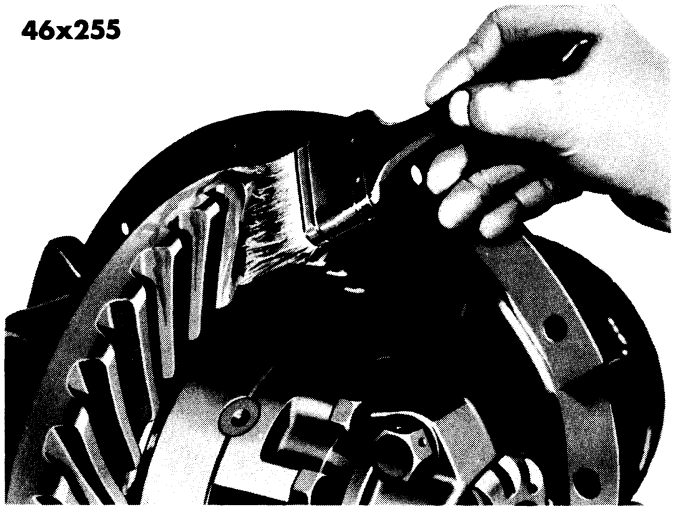
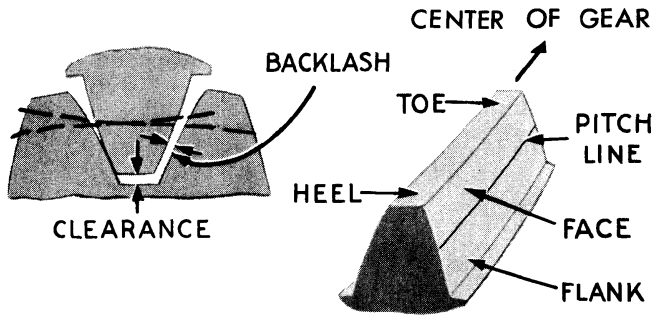


Figure 27—Applying Red Lead to Gear Teeth



45x416

Figure 28—Gear Tooth Nomenclature

pinion correctly set. Whenever the adjustment of the differential assembly is changed to obtain correct tooth contact, readjust the differential bearing pre-load and the backlash between the ring gear and pinion.

CHECKING TOOTH CONTACT

If all the adjustments have been correctly made, the gears will be properly meshed and quiet in operation. However, proper tooth contact is essential for quiet gear operation and long life, therefore, it is recommended that the tooth contact be checked with red lead before the differential carrier assembly is installed in the axle housing.

Check tooth contact by means of red lead applied to the ring gear teeth. See Figure 27. Apply load against the back face of the ring gear with a round bar as the drive pinion is rotated. This leaves a bare area, the size, shape and location of contact.

If upon examination, improper tooth contact is evident, as indicated in Figure 29, the pinion gear should be adjusted either forward or backward, or the ring gear to or from the pinion to maintain backlash within specified limits, until correct tooth contact has been obtained.

With adjustments properly made, correct tooth contact, as shown in Figure 29, will result. Notice that the contact pattern is well centered on the drive and coast sides, about $\frac{1}{16}$ inch from the edges of the teeth. When tooth marks are obtained by hand, they are apt to be rather small. However, under an actual operating load, the contact area will spread out—the higher the load, the greater becomes the contact area.

Figure 29, showing improper or incorrect tooth contact, call for readjusting the ring gear and pinion as follows: Refer to Figure 28 for Gear Nomenclature.

HEAVY FACE CONTACT

If the tooth marking is across the length of the tooth, narrow and high on the tooth face, as shown in Figure 29, the teeth will roll over or gall. This type of contact causes excessive wear and noise.

To correct heavy face contact—move the pinion in toward the center of the ring gear by installing a thicker washer behind the pinion. Readjust backlash.

HEAVY TOE CONTACT

If the tooth marking is too heavy on the toe of the tooth (Figure 29), the tooth edges might chip and damage or execessive wear will result.

To correct heavy toe contact—move the ring gear away from the pinion. However, this adjustment might increase the backlash beyond .010 inch. If such is the case, insert a thicker washer behind the pinion. This will move the pinion in toward the ring gear and bring the backlash within specifications of .006 to .010 inch.

HEAVY FLANK CONTACT

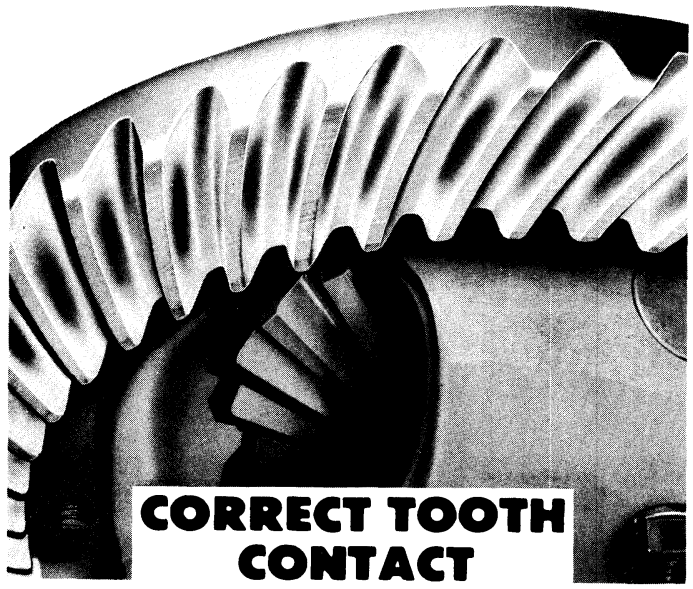
If the tooth marking is across the length of the tooth, but narrow and low on the flank (Figure 29), the teeth will gall or score. This type of contact causes excessive wear and noise.

To correct heavy flank contact—move the pinion away from the center of the ring gear by using a thinner washer behind the pinion. Readjust backlash.

HEAVY HEEL CONTACT

If the tooth marking is too heavy on the heel of the tooth (Figure 29), the tooth edges might chip and damage or excessive wear will result.

To correct heavy heel contact—move the ring gear in toward the pinion. However, this adjustment may decrease the backlash. If such is the case, insert a thinner washer behind the pinion. This will move the pinion away from the ring gear and bring the backlash within specifications.



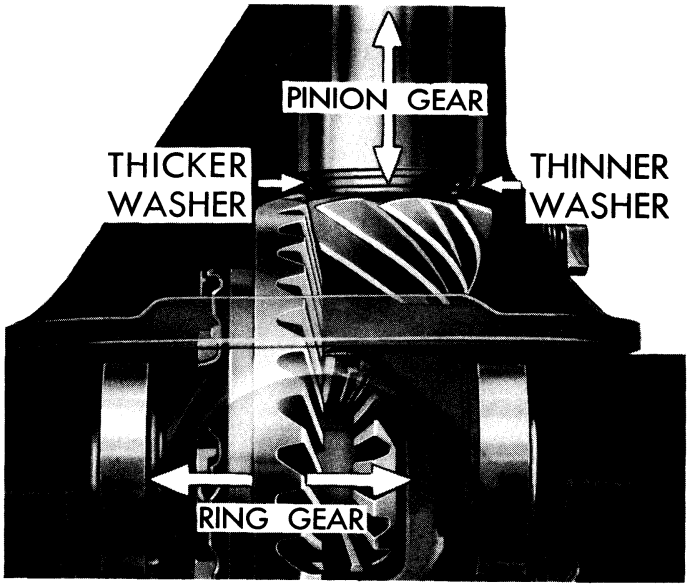


Figure 29—Gear Tooth Contact Patterns

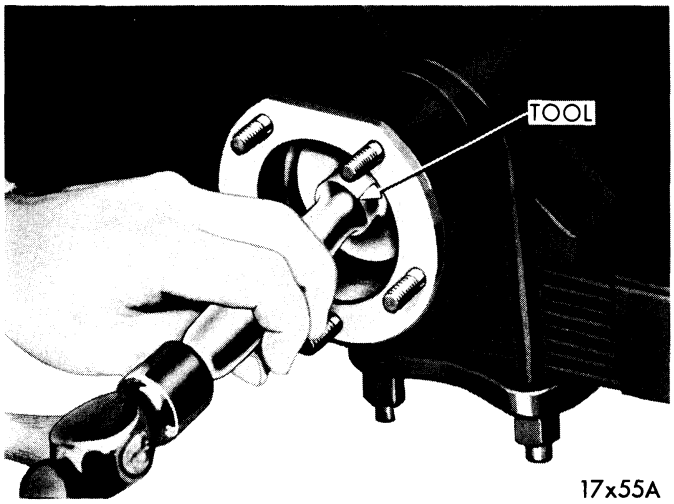


Figure 30—Installing Axle Shaft Oil Seal

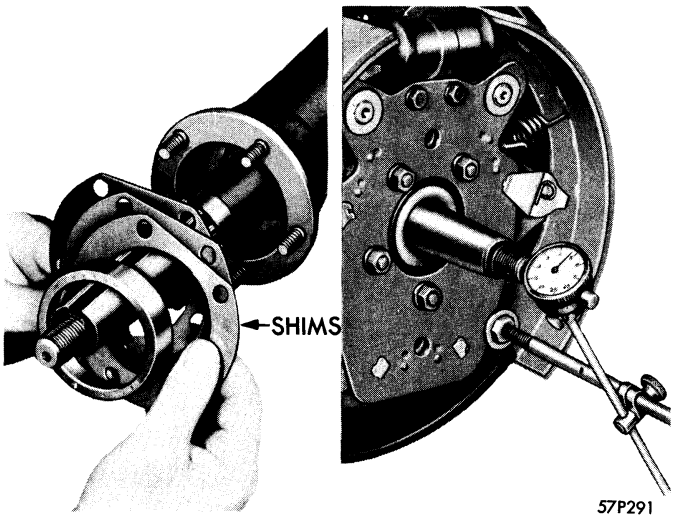


Figure 32—Axle Shaft Bearing Adjusting Shims Checking Axle Shaft End Play

9. REAR AXLE INSTALLATION

Install the carrier assembly to the axle housing, using a new gasket. Tighten the mounting nuts from 40 to 45 foot-pounds. Reinstall the rear axle drive shaft inner oil seal, using Tool C-839. See Figure 30.

> **NOTE**
>
> ***Whenever oil seals have been removed, or disturbed, always install new seals at reassembly.***

To reinstall the axle shaft, first replace the bearing on the axle shaft, using Tool C-158. See Figure 31. Insert the axle shaft in the housing, making sure the shaft and differential side gears splines are in alignment.

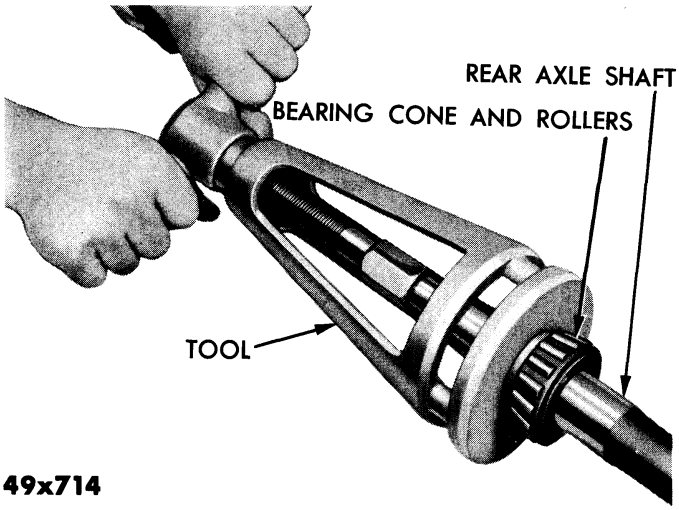


Figure 31—Installing Axle Shaft Bearing

Install the axle drive shaft outer bearing cup (if removed), using Tool C-413. Install shims in the same manner as they were removed, so as to maintain the central position of the axle shaft thrust block. Install sleeve Tool C-757 in the axle bearing outer oil seal before mounting the brake support plate to the axle housing. This will protect seal from being damaged by the axle shaft keyway during installation.

10. AXLE SHAFT END PLAY

Axle shaft bearings are adjusted by removing or installing shims; which are available in various thicknesses. One or more of these shims should be used as required to obtain proper adjustment.

When checking axle shaft end play, if it is necessary to add or remove more than .020 inch shims, half of the amount should be added or removed on each side to retain the center position of the thrust block on the differential pin, between the two axle shafts.

To check axle end play, remove wheel and hub, then tighten the brake support plate attaching nuts securely. Tap each axle shaft lightly to be sure the bearings are seated, then place a dial indicator on the axle drive shaft and housing, as shown in Figure 32. Pull out and push in on the shaft to obtain the end play reading on the indicator.

If the dial indicator shows less than .013 inch or more than .018 inch end play, remove the brake support plate and oil seal and add or remove shims as required (see Figure 32). As a final operation, check the end play again with the dial indicator to make sure it comes within the .013 to .018 inch limits. Tighten support plate retaining nuts from 30 to 35 foot-pounds. Connect brake tubes and bleed brakes. Fill the rear axle differential with the correct viscosity Hypoid oil.

11. SURE-GRIP DIFFERENTIAL

GENERAL

The conventional rear axle delivers the same amount of torque to both axle shafts. The driving force is therefore, limited by the wheel which has the least amount of traction. If one of the rear wheels gets on an icy patch or into soft mud, its friction against the road lowers suddenly so that the torque delivered to that wheel is often great enough to overcome friction causing the wheel to spin.

To overcome these characteristics of the conventional differential, the sure-grip differential permits the axle shaft whose wheel has the greater traction to develop a considerable amount of torque thus enabling the car to pull out of its difficulty.

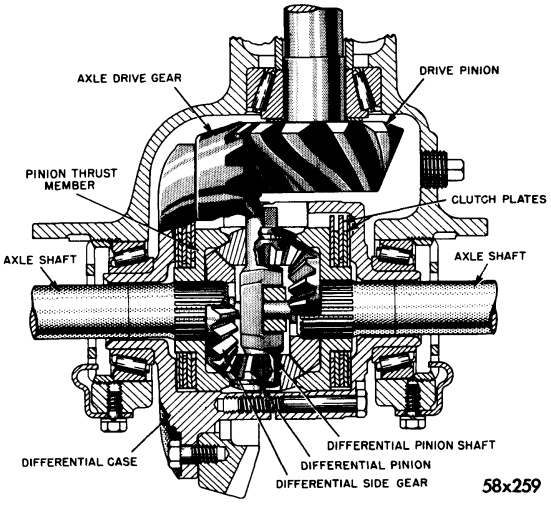


Figure 33—Sure-Grip Differential (Cross-Section)

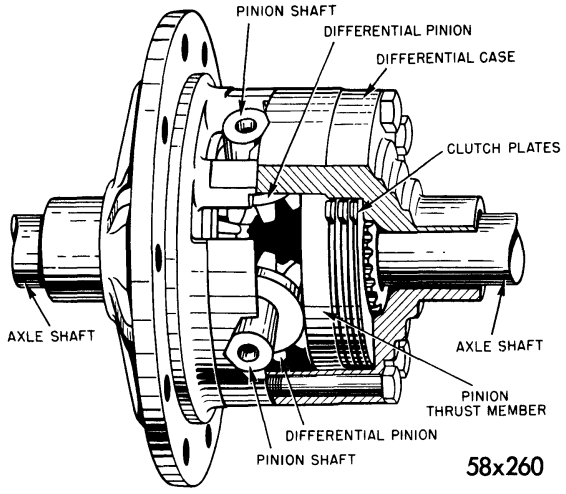


Figure 34—Sure-Grip Differential Cross-Section

DESCRIPTION

The sure-grip differential is similar to the conventional differential except for the addition of friction plates for clutching the differential case to the differential gears and a means for engaging these plates. It has four pinion gears, positioned in the case by two pinion shafts which are at right angles to each other and loose fitting at their intersection. Both ends of each shaft have two flat surfaces, or ramps, which mate with identical ramps in the differential case. There is additional clearance in the case to permit slight movement of the ends of the pinion shafts within the case.

OPERATION

Torque delivered by the engine is transmitted to the rear wheels by the axle drive pinion and drive gear to the differential case and to the pinion shafts which are rotated by the case. The pinion shafts carry the pinion gears around, rotating the differential side gears and the axle shafts which are splined to the side gears. The friction of the wheels against the road, and the friction of the differential gears make the pinion shafts resist turning so that the driving force causes the pinion shaft ramps to slide against the differential case ramps pushing the pinion shafts apart slightly. As the pinion shafts move outward, two of the pinions on one of the pinion shafts bear against one of the pinion thrust members and two pinions on the other pinion shaft bear against the other thrust member. Each thrust member is splined to one of the axle shafts and drives two friction plates of the clutch. The other two friction plates of each clutch are attached to the differential case so that when they

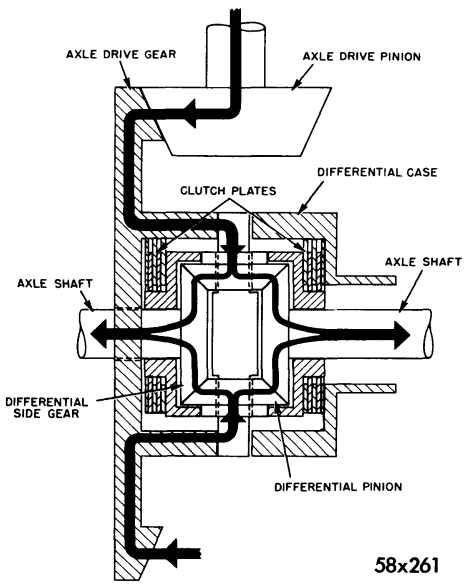


Figure 35—Power-Flow Axle Shafts Turning at Same Speed

are engaged, both axle shafts become clutched to the case to a degree that varies with the amount of torque transmitted.

This prevents momentary spinning of the wheels when encountering poor traction. Refer to Figures 35 and 36 for "PowerFlow".

CAUTION

Before raising a rear wheel off the ground, shut off engine, set parking brake tightly, and carefully block front wheel diagonally opposite the one to be removed against both forward and rearward movement.

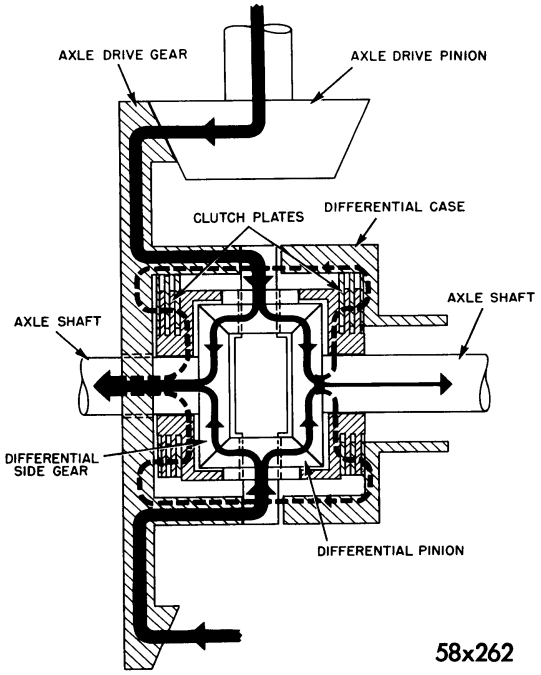


Figure 36—Power-Flow Axle Shafts Turning at Differential Speeds

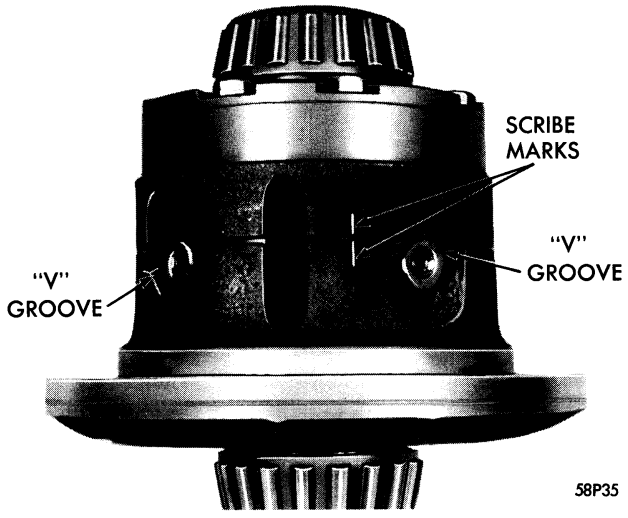


Figure 37—Case Halves Scribed for Proper Reassembly

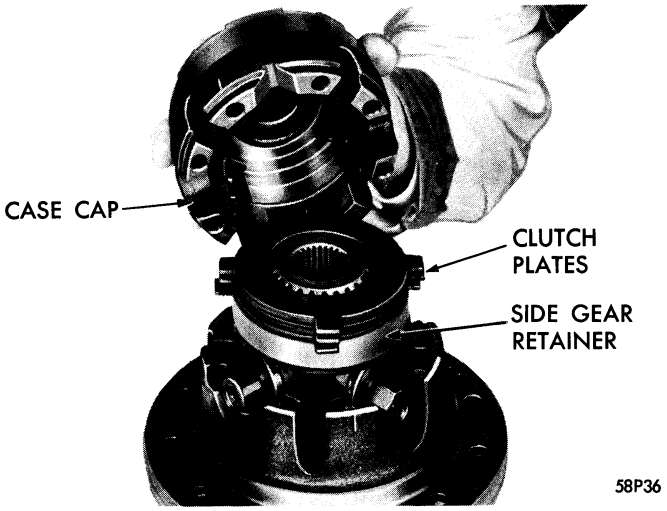


Figure 38—Removing or Installing Differential Case Cap

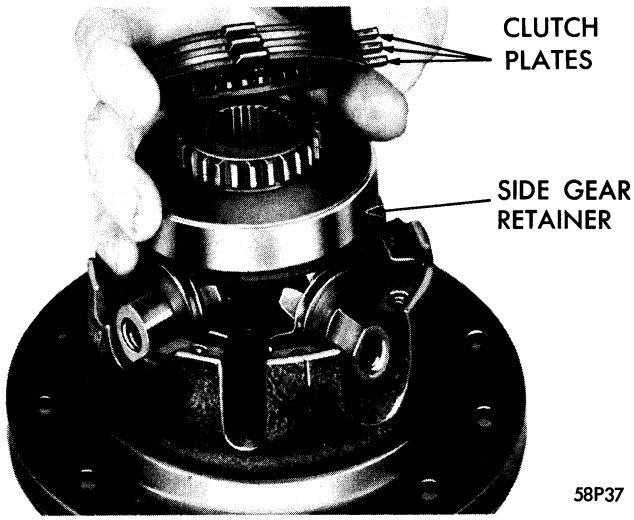


Figure 39—Removing or Installing Clutch Plates (Cap Side)

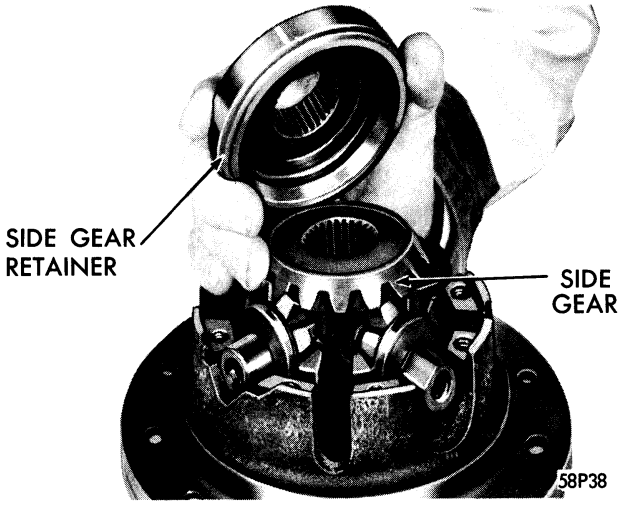


Figure 40—Removing or Installing Side Gear Retainer (Cap Side)

REMOVAL AND DISASSEMBLY OF DIFFERENTIAL

Remove differential and carrier assembly in the same manner as outlined on page 21. Remove axle drive gear. Check run-out of drive gear mounting flange. Replace both case halves if run-out exceeds .003 inch. Before disassembling case halves, place scribe marks on each half to aid in aligning case when reassembling, as shown in Figure 37.

Remove case cap attaching bolts and remove case-cap, as shown in Figure 38. Remove clutch plates, Figure 39, (noting relation of clutch plates). Remove gear retainer Figure 40. Remove side gear Figure 41. Remove pinion shafts with pinion gears Figure 42. Remove remaining side gear Figure 43, side gear retainer, Figure 44 and clutch plates Figure 45. Remove axle shaft thrust spacer by pressing out lock pin.

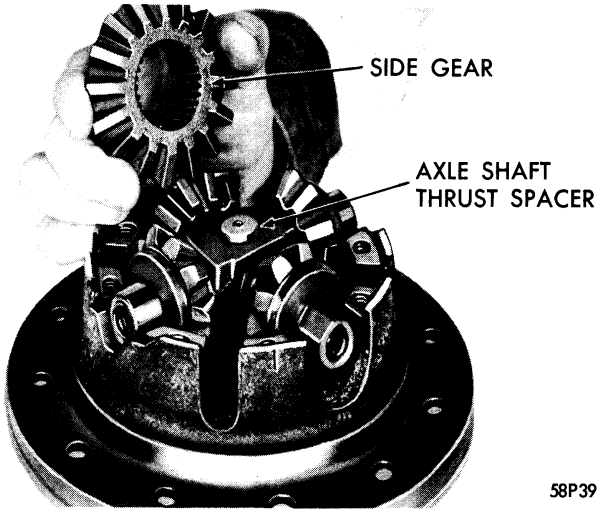


Figure 41—Removing or Installing Side Gear (Cap Side)

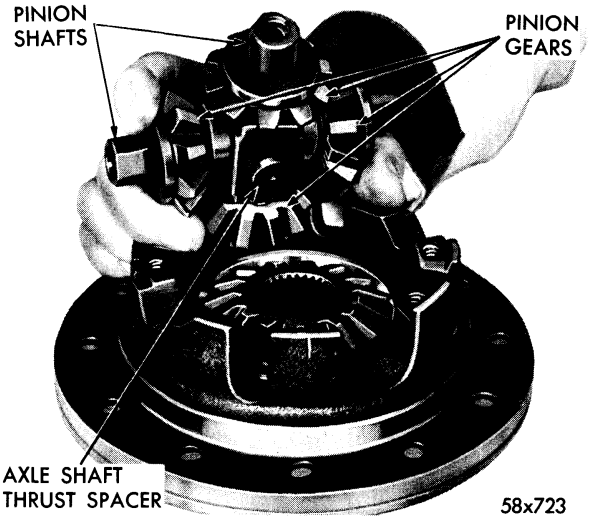


Figure 42—Removing or Installing Pinion Shafts and Pinion Gears

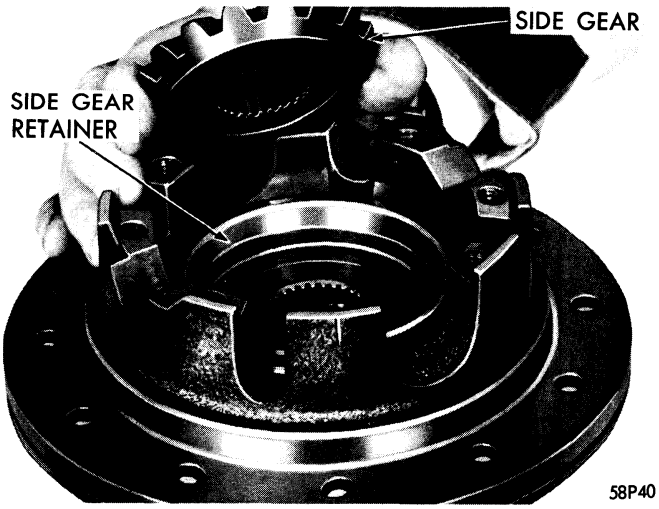


Figure 43—Removing or Installing Side Gear from Differential Case

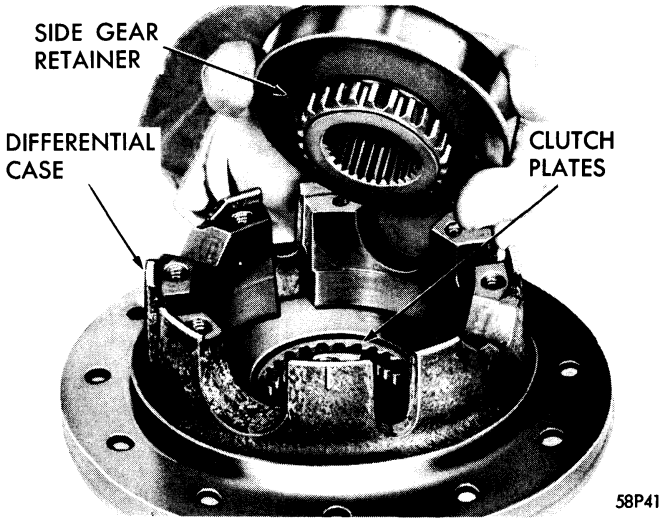


Figure 44—Removing or Installing Side Gear Retainer from Differential Case

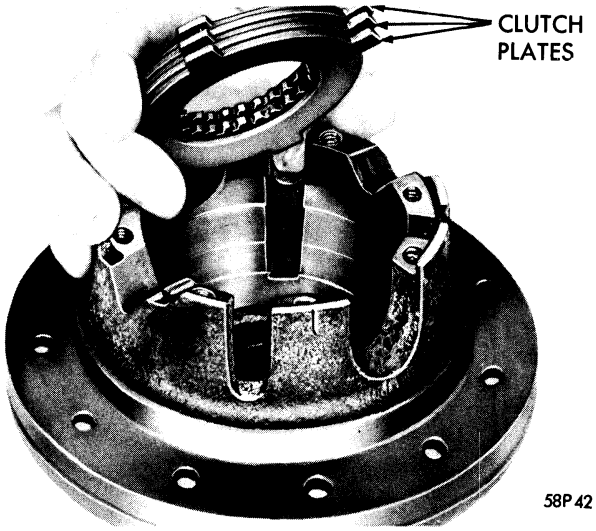


Figure 45—Removing or Installing Clutch Plates from Differential Case

ASSEMBLY AND INSTALLATION

Clean all parts thoroughly. Inspect all parts for wear, nicks and burrs. Replace worn or distorted clutch plates. If case is worn, it will be necessary to replace both halves.

Install clutch plates alternately so that an external tanged plate (approximately 1/16 inch thick) is installed first, followed by an internal splined plate until 5 plates are installed. The thin plate (approximately 1/16 inch) should be installed so that it will be toward the case. Install one side gear retainer, see Figure 44 engaging splines of retainer with internal splined clutch plates. Install one side gear, see Figure 43.

Install a lock pin in one of the axle shaft thrust spacers, drive pin until pin appears at thrust end of spacer but does not extend beyond thrust face. Align the pinion shafts and install spacer and pin through holes in pinion shafts. Install the other axle shaft thrust spacer, engaging the lock pin, as shown in Figure 46. Press spacer onto the lock pin until the two spacers are in contact. Thrust spacers are a loose fit in pinion shafts.

Install the four pinion gears on the pinion shafts and install the shafts and pinions assembly in position, see Figure 42. Install side gear see Figure 41, side gear retainer see Figure 40, and clutch plates see Figure 39. Install clutch plates alternately with one thick plate (with tang) facing side gear retainer followed by an internal splined plate until 5 plates are installed.

NOTE

The thin plate (approximately 1/16 inch) should be installed so that it will be towards the case cap.

Install case cap, as shown in Figure 38. Make sure that scribe marks are in alignment as shown Figure 37.

Install cap attaching bolts. Tighten evenly to 40 foot-pounds torque. Check the clearance between the pinion mate shaft and the "V" of the case as shown in Figure 47. Place feeler gauges on both ends of the same shaft and on opposite sides of the "V" so that the total shaft to case clearance can be checked. Do this for both shafts. Clearance should not exceed .020 inch. If clearance exceeds .020 inch with existing clutch plates, install new plates and recheck. If clearance is still excessive check shafts and case for wear.

Install drive gear and differential assembly in the same manner as outlined for the conventional differential assembly on page 32.

IMPORTANT

Use only special differential lubrication, part number 1879414 available from the Parts Division.

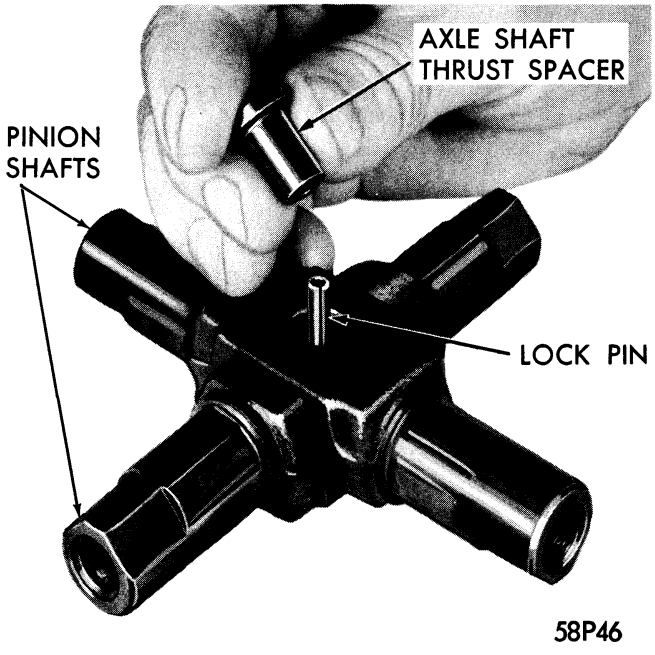


Figure 46—Installing Axle Shaft Thrust Spacers

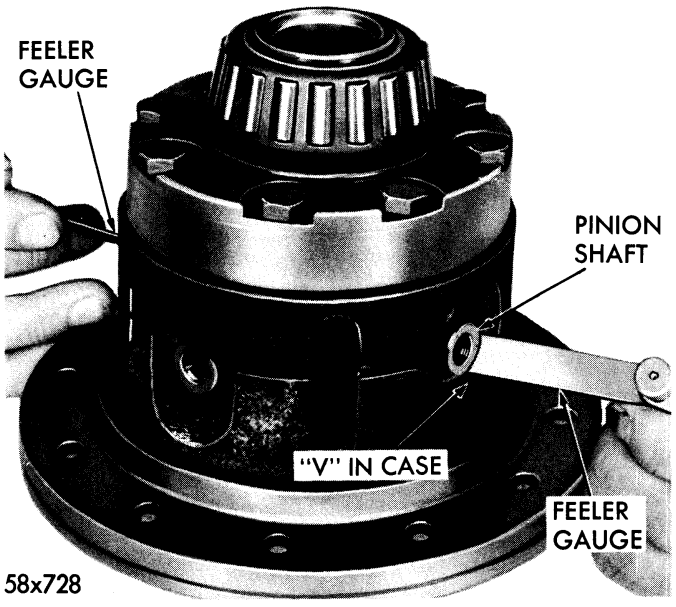


Figure 47—Checking Clearance Between Pinion Mate Shafts and Case

12. DIAGNOSIS PROCEDURES

LEAKAGE

If the vent is plugged, leakage of rear axle lubricant may result. When there is an excessive amount of lubricant in the differential, a high pressure will build up and force the lubricant out through the seals and gasket.

CAUTION

When applying undercoating, be sure the vent for the rear axle housing is covered. Remove vent covering after undercoating.

1. *AXLE SHAFT OIL SEALS*—Grease may leak out around the brake support plate. Grabbing brakes may also indicate leakage at oil seal.

2. *DRIVE PINION BEARING OIL SEAL*—Inspect the underside of the rear floor pan for presence of lubricant.

3. *CARRIER GASKET*—Leakage at carrier indicates a loose or damaged gasket.

4. *REAR AXLE HOUSING*—Inspect the seams along welds for leakage and carrier housing for sand holes.

NOISES

Rear axle noises are often confused with sounds that originate in other parts of the car, such as wheel bearings, loose wheel bolts, tires, clutch, transmission, and universal joints. Always make a careful inspection of these units before condemning the rear axle.

1. *TIRES*—Tire noise will vary, depending upon the type of road surface and the condition of the tire tread. Road testing on different types of pavement will usually indicate whether or not the tires are noisy. Road test the car on smooth pavement at a speed where the noise is most audible. Then, disengage the clutch and apply the brakes. If the noise increases, it can be assumed that the tires are causing the noise.

2. *WHEEL BEARINGS*—To determine if the wheel bearings are worn or damaged, road test the car and apply the brakes. This action will take some of the load off the wheel bearings. Noise, if present, will diminish, indicating that the bearings may be at fault.

3. *EXHAUST*—Test for exhaust system noise by slowing and increasing engine speed with the car standing still. Noise should be apparent as long as the engine speed is steady. But, it will fade when the engine speed is increased or decreased. Loose tail pipe brackets or a bent tail pipe will cause rattling noise.

4. *CLUTCH*—Noise resulting from a faulty clutch disc unit may be heard when the car is accelerating at speeds of 25 to 30 miles an hour, or while coasting down from 45 to 38 miles an hour.

5. *PROPELLER SHAFTS*—An unbalanced shaft can cause excessive vibration and noise at speeds above 50 miles an hour.

6. *DIFFERENTIAL AND CARRIER ASSEMBLY*—The main difference between an axle bearing noise and a gear noise is in the duration and the sound. Bearing noise is continuous and may change slightly in volume only as the speed changes. Slightly worn or damaged bearings cause a "sizzling" noise. Bearings that are badly worn, or broken, will make a rough grating sound.

A continuous whine may be produced by a pinion and ring gear which are set up too tightly—not enough backlash. Gear noise comes in when the car is being driven under load, on the coast, or on both the pull and coast. But, gear noise changes in volume and in pitch as the car speed changes. There can also be a combination bearing and gear noise.

(a) Steady Noise on Pull—Loss of lubricant, the use of improper lubricant or improper mesh of gear teeth will cause a steady hum.

(b) Steady Noise on Coast—Gear teeth that are badly scored due to excessive end play in the pinion bearings, or because of improper adjustment of bearings, will cause a steady hum.

(c) Bearing Noise on Pull and Coast—When the pinion or differential bearings are scored, chipped, cracked, or badly worn, a noise will be heard when accelerating, or coasting down to lower speeds.

(d) Ring Gear and Pinion—A sharp, metallic sound, heard when shifting from reverse into a forward speed, may indicate that the ring gear is creeping on the case, or that its mounting bolts are loose. A thumping sound, heard when the car is turning a corner, may be due to a broken tooth, or a large nick in a differential side gear.

7. *AXLE SHAFTS*—Excessive end play in the rear axle shafts will cause a thump or chuckling noise when driving on a rough road, or especially, when turning a corner.