DIFFERENTIAL

EATON

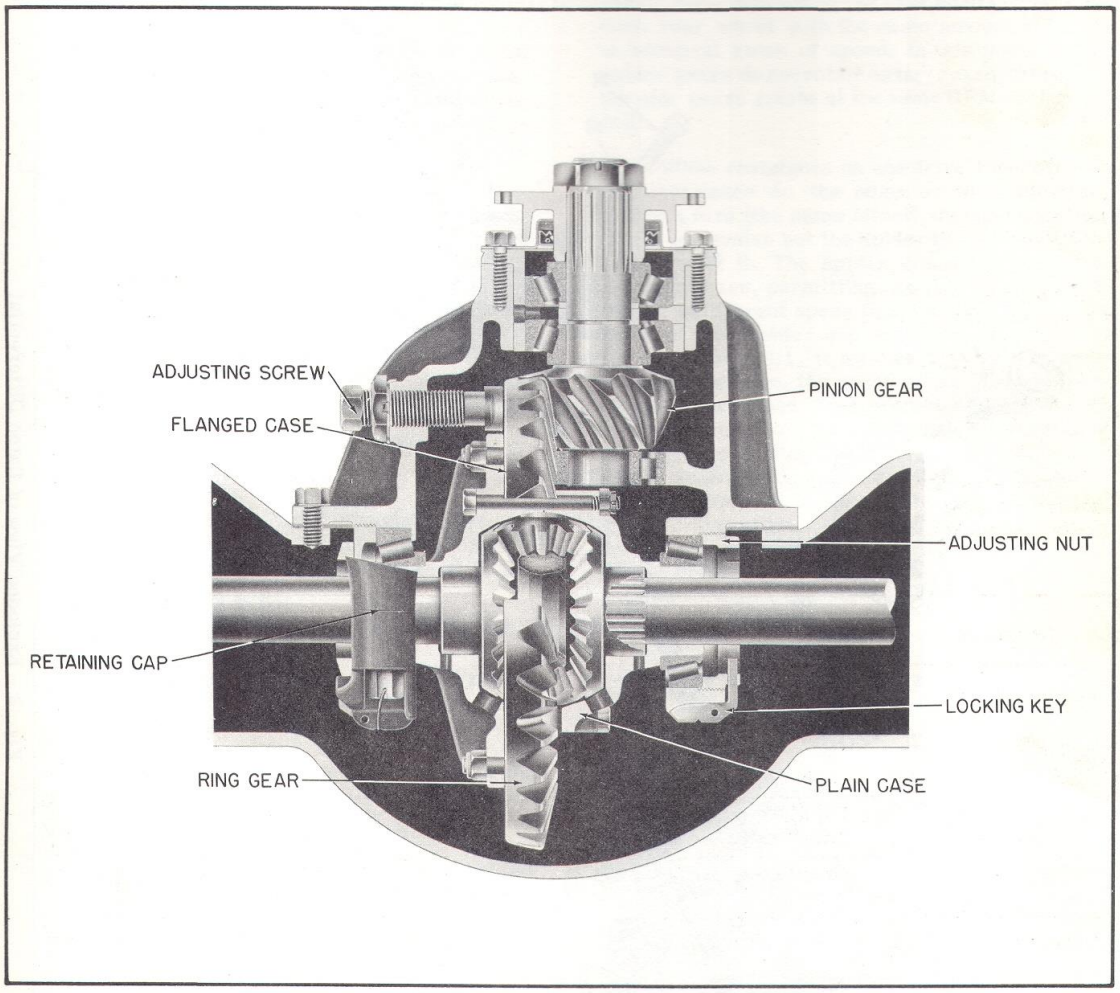


Fig. 1 - Cutaway Of Eaton Differential

THE DIFFERENTIAL SERVES FOUR BASIC FUNCTIONS:

1. It transmits the torque from the drive line to the axle shafts.

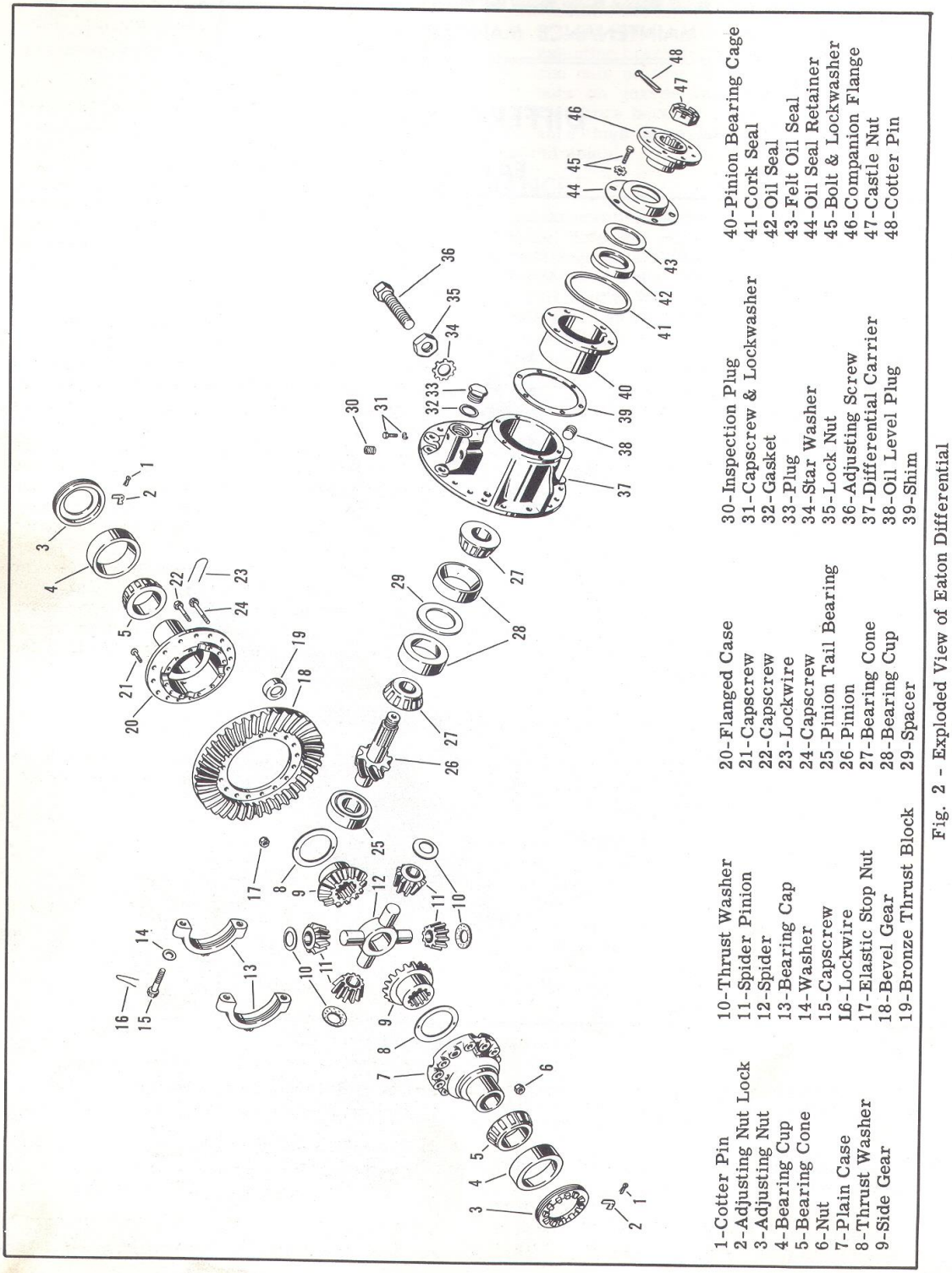
2. It permits one drive wheel to rotate at a different speed than the opposite wheel.

3. It provides the first step of the rear axle gear reduction, thus providing an increase of torque.

4. It is second and complimentary to the planetary system in offering the selection of a gear reduction most suitable to specific operations.

The differential model and the original pinion and bevel gear ratio will be found stamped on the

DIFFERENTIAL



1-Cotter Pin
2-Adjusting Nut Lock
3-Adjusting Nut
4-Bearing Cup
5-Bearing Cone
6-Nut
7-Plain Case
8-Thrust Washer
9-Side Gear
10-Thrust Washer
11-Spider Pinion
12-Spider
13-Bearing Cap
14-Washer
15-Capscrew
16-Lockwire
17-Elastic Stop Nut
18-Bevel Gear
19-Bronze Thrust Block
20-Flanged Case
21-Capscrew
22-Capscrew
23-Lockwire
24-Capscrew
25-Pinion Tail Bearing
26-Pinion
27-Bearing Cone
28-Bearing Cup
29-Spacer
30-Inspection Plug
31-Capscrew & Lockwasher
32-Gasket
33-Plug
34-Star Washer
35-Lock Nut
36-Adjusting Screw
37-Differential Carrier
38-Oil Level Plug
39-Shim
40-Pinion Bearing Cage
41-Cork Seal
42-Oil Seal
43-Felt Oil Seal
44-Oil Seal Retainer
45-Bolt & Lockwasher
46-Companion Flange
47-Castle Nut
48-Cotter Pin

Fig. 2 - Exploded View of Eaton Differential

DIFFERENTIAL

differential carrier. The rear axle model and the above ratio will be found stamped on the banjo housing near the filler plug.

The more common differential installation features the operation of the pinion shaft in a left hand or counter clockwise rotation, when looking at the differential from the rear. This is the same direction of rotation as the normal drive line motion.

There are applications of the differential which, in certain models, involve the use of transmissions which deliver a right hand or clockwise rotation, when viewed from the rear. This is sometimes referred to as Reverse Rotation or Opposite Rotation.

To rectify the reverse motion of this type installation, the differential is mounted 180° from the normal top center line. This places the bevel gear on the opposite or right hand side of the pinion (as viewed from the rear), establishing the correct rotation to the differential assembly. In reverse rotation differentials, the gear teeth are machined with their spirals cut in the opposite direction to prevent driving on the coast side of the teeth.

OPERATION

The differential is rigidly mounted on the forward side of the rear axle housing and is directly connected, by a splined companion flange, to the flanged yoke on the driveline. The pinion is mated with the differential bevel gear, which is bolted to the flanged case.

When both drive wheels are free to turn under equal resistance loads, the differential ring gear and the four small pinion gears (spider gears) act as one rigid unit, transmitting torque to both of the splined differential side gears. The side gears, being splined to the axle shafts, then drive each rear wheel with the same amount of torque at identical rates of speed. In this instance, the spider gears do not rotate on their axes, therefore, the side gears rotate at the same RPM as the ring gear.

When resistance on one drive wheel exceeds the resistance on the other or when the truck makes a turn (the same effect), the right gear continues to revolve but the spider gears cease to act rigidly with it. The spider gears now rotate on their own axes, permitting one drive wheel to rotate at a different speed than the other. Since the ratio of the spider and side gear assembly is approximately 2:1, it follows that as one drive wheel slows down, the speed of the other proportionately increases. This prohibits the application of a tortional load, to either axle, greater than that existing during normal operation. Thus the spider gears serve a dual purpose: 1 - They permit a differential in speed between the two drive wheels, permitting maximum maneuverability. 2 - They prohibit the application of all of the torque to one axle shaft.

REMOVAL FROM VEHICLE

1. Before starting to remove the differential, make sure the vehicle is well blocked from rolling when the brake is released.

2. If the differential is to be removed, it is not necessary to jack up the wheels or to remove the driving flanges or planetary gearing.

3A Units equipped with the 4RA rear axle have the planetary gearing inboard and require removal of both inner and outer axle shafts. The caps and outer axle shafts have to be removed, see Figure 3, to permit accessibility to the inner shafts, the ends of which are engaged with the differential side gears. With a tool similar to the threaded rod, shown in Figure 4, inserted into the threaded hole of the inner axle shaft, withdraw the inner shaft far enough to grasp the end. Remove the threaded rod.

3B Units having the planetary outboard (encased in the drive wheel) use only one axle shaft. In this case remove the driving flange cover plate and, with a suitable hook tool, reach in and withdraw the sun pinion, bringing with it the axle shaft. All that is necessary is to bring the axle shaft out of engagement with the differential side gear. See Figure 5.

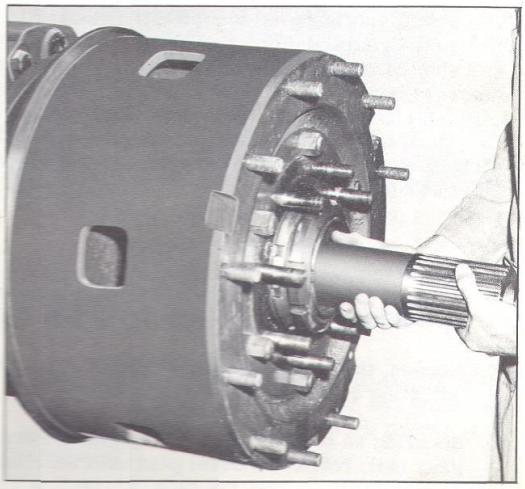


Fig. 3 - Removal Of Outer Axle Shaft

DIFFERENTIAL

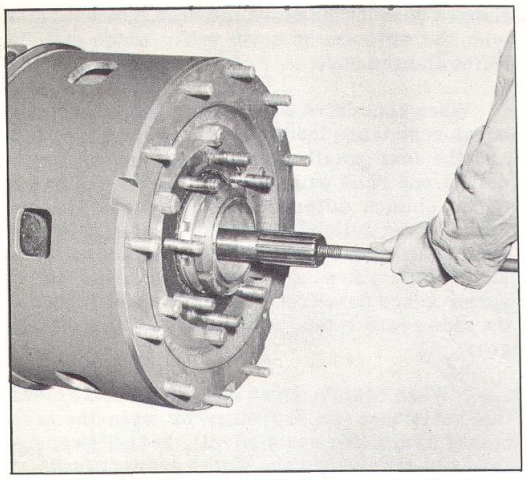


Fig. 4 - Removal Of Inner Axle Shaft

4. Remove the drain plug at the bottom of the banjo housing and drain the differential gear lubricant.

5. Remove the capscrews (bolts) attaching the driveline to the rear companion flange. On some models it may be necessary to remove the snap ring and slack adjuster from the brake control shaft.

6. Tap the brake shaft toward the wheel JUST ENOUGH TO ALLOW THE DIFFERENTIAL CARRIER TO MOVE FORWARD. If driven too far, the brake shaft will carry the brake operating cam out from between the brake shoe rollers and the brake shoe return spring will cause the shoes to clamp down on the brake shaft, preventing the cam from returning to its proper place.

7. Remove the nuts which secure the differential carrier in place. Support the carrier with a floor dolly or lift hoist.

8. With care so as not to spring the studs or cause damage to the threads, slide the differential carrier forward to free it from the studs.

9. Remove and thoroughly clean the differential carrier, making a visual inspection for wear and damage.

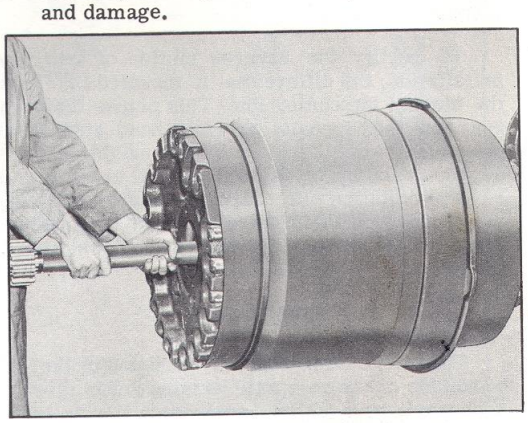


Fig. 5 - Pull Shaft Out Of Engagement

DISASSEMBLY

Numbers in parentheses refer to Figure 2.

Give the differential a good visual inspection. Rotate the gears and note their operation for noise and smooth running. Check both the pinion and side bearings for wear. Check the running of the bevel gear; it should not have any noticeable wobble. If the run-out is noticeable, the bevel gear (18), flanged case (20), or both are sprung and should be discarded upon disassembly.

BEVEL GEAR GROUP

1. At the side of the differential carrier, pry up the tang of the adjusting nut lock (34).

2. Loosen the lock nut (35) and back away the adjusting screw (36). See Figure 6.

3. Securing an ordinary "C" clamp over the bevel gear (18), rotate the bevel gear until the clamp rests solidly against the case, preventing further rotation of the gear.

4. Remove the cotter (48) from the pinion end and loosen the companion flange nut (47).

5. Remove the adjuster lock cotters (1) and take off the adjuster locks (2). If the differential is being given a periodic cleaning, inspection and adjustment, it will be worth while to place a small reference mark at the very bottom of the first exposed thread on the side of the adjusting nut (3), where the lock (2) was removed. This can easily be done with a small center punch and will facilitate reassembly of the adjusters to their original position.

6. Withdraw the capscrew lockingwires (16) and turn out the capscrews (15). Remove bearing caps (13). Remove the cap dowel bushings, if used.

7. Lift the bevel gear and differential case from the carrier (37) as an assembly.

8. Place assembly in a soft jawed vice, with the plain case (7) upward and the bevel gear (18)

DIFFERENTIAL

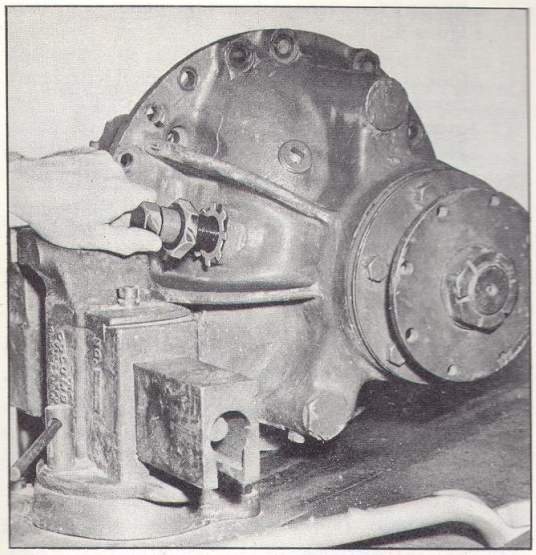


Fig. 6 - Back Away Adjusting Screw

resting upon the vice jaws. Clamp the jaws lightly on outer diameter of the flanged case (20).

9. Cutting the capscrew lockwires (23), remove the case capscrews (22) and (24). Note the reference marks at the spider journals of the two cases.

10. Remove the differential plain case (7) see Figure 7, the side gear thrust washer (8), and the side gear (9).

11. Lift out the spider assembly and slide the thrust washer (10) and spider pinion (11) from each spider journal.

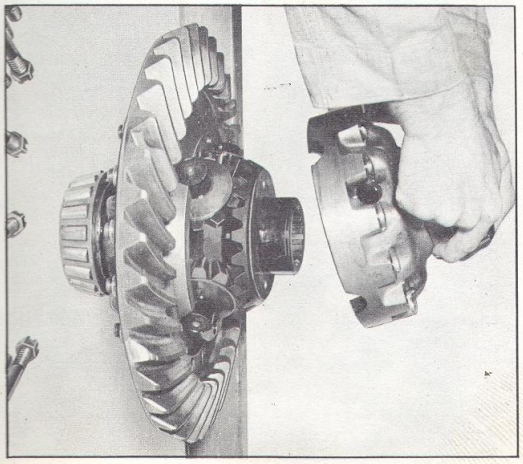


Fig. 7 - Lift Off Plain Case

12. Lift out the remaining side gear (9) and thrust washer (8).

13. Reversing the position of the flanged case and bevel gear in the vise, clamp the jaws lightly on the case body.

14. Remove the nuts (17) from the bevel gear attaching bolts (21) and drive out the bolts. In driving out the bolts, do not damage the machined faces that form the nut seats.

15. Remove the bevel gear (18) from the flanged case (20).

16. With a suitable puller and the proper discs, remove the bearing cones (5) from the flanged and plain cases.

PINION GAGE GROUP

1. With a long bar and a hammer, drive on the inner end of the pinion shaft (26), removing the pinion (26), bearings (27-28), and cage (40) as an assembly. See Figure 8. An alternate method is to install two puller screws in the tapped holes provided in the cage flange. If this method is used, care must be taken to turn both puller screws the same amount. It is extremely important that the cage flange is not distorted.

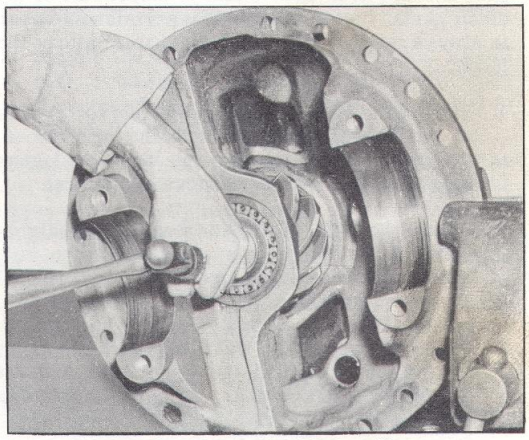


Fig. 8 - Drive Out Pinion Cage

2. Remove the nut (47) from end of pinion shaft and, with care so as not to damage the flange, pull off the companion flange (46).

3. Remove the seal capscrews and lock washers (45) and the oil seal retainer assembly (44). Pull the cork seal (41) from its recess in the cage (40).

4. Grasping the pinion (26), jar the threaded end

DIFFERENTIAL

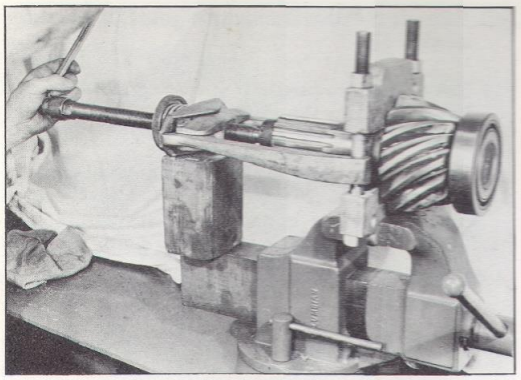


Fig. 9 - Removing Pinion Bearing

of the shaft on a block of wood. The jarring will remove the cage assembly, carrying the outer pinion bearing (27-28) with it. Remove the bearing spacers (29).

5. With a suitable puller and bearing splitter, remove the inner bearing cone (27). See Figure 9.

6. Mask the tail bearing (25) or pack it with heavy grease. This is to keep cuttings or grit from entering the bearing. With a file or small hand grinder, remove the lips of the staked areas and clean away the accumulated grit.

7. With a puller and bearing splitter, remove the tail bearing (25).

8. Place the cage in a soft jawed vice, being careful not to distort the cage (40).

9. Using a mild steel bar as a drift, rotate the cage (40) and drive out the bearing cups (28).

   NOTE: Continual driving on a small area of the cup will cause the metal to swell, creating a rough surface upon which the rollers must travel.

10. From the carrier housing, remove the bevel gear thrust block (19), the adjusting screw (36), the lock nut (35), and the star washer (34).

INSPECTION

Thoroughly clean and air dry all parts. Prepare a clean area upon which to inspect all of the clean parts. Due to the fact that permissable wear is always controversial, the mechanic is to be the judge.

1. Inspect the plain and flanged cases for cracks at the bearing bores. Check the pilot faces, the gear thrust areas, and the bevel gear mounting areas for roughness and burrs.

2. Check the axle shafts for wear and straightness. A defective axle shaft will soon fail, causing extensive damage to the differential gears and bearings.

3. Check all gears for wear, scuffing, chipping, flaking or pitting of the gear teeth. Inspect the pinion shaft splines. A pocket magnifying glass is indispensible for making these checks.

4. The tail bearing should be a hand-pressed fit in the housing bore, but can be slightly loose without danger. Remember, however, that as looseness increases, the greater the load that will be imposed upon the pinion tapered bearings.

5. The bearing cups, cones, and bores should be checked for wear, flaking, pitting and chipping.

6. Check the depth that the bearing rollers have worn into the wear surfaces. If the thrust face at the large end of the roller, which is ground and polished as shown in the left bearing in Figure 10, is chipped or worn down to the center area, as shown in the right bearing of Figure 10, or if the separator has become worn enough to drag on the cone, discard the bearing.

7. Check the thrust washers for wear and scoring. Since the outer edge of the washer is not subject to wear, a check should be made of both the outer and inner thicknesses. If the difference is more than .005, the washer should be replaced.

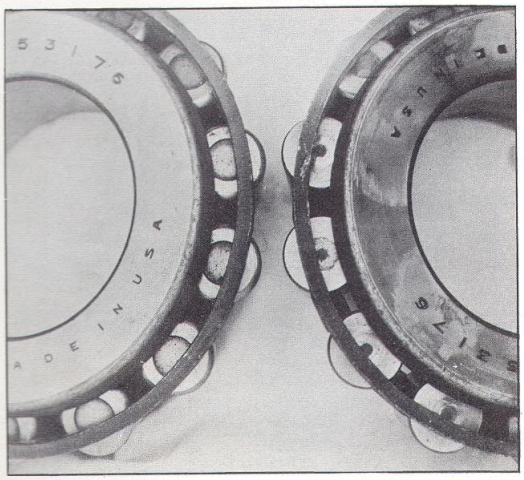


Fig. 10 - Pinion Bearing Roll End Wear

DIFFERENTIAL

ASSEMBLY AND ADJUSTMENT

Numbers in parentheses refer to Figure 2.

Care and cleanliness cannot be overstressed. Make sure all parts are clean and are free from nicks, burrs, and other damage or defects. A small metal particle at a critical point, like behind the bearing cap, can cause serious damage and premature failure of the differential. Take the time to clean the tools and the work area.

To be sure of meeting assembly specifications, refer to the Torque and Lubrication Charts at the end of this section.

A number, similar to plus or minus .005'' for older pinions and 52 or .052'' for new pinions, will be found etched upon the pinion splines. This etched number must be recorded for future use, as it cannot be seen after assembly.

An etched identification mark similar to ''A-4-42'' will be found on both the pinion and the bevel gears, indicating them to be a matched set. If the markings are not identical on both gears, they have become mixed and should not be used together.

PINION GAGE ASSEMBLY AND BEARING PRELOAD

If the original pinion cage is being used again, the chance is that only a slight change in bearing spacer thickness will be required. The same is true for the cage shims.

1. Assemble the pinion (26), bearings (27-28), and spacers (29), in the cage (40), but temporarily omit the oil seal retainer (44) from the assembly.

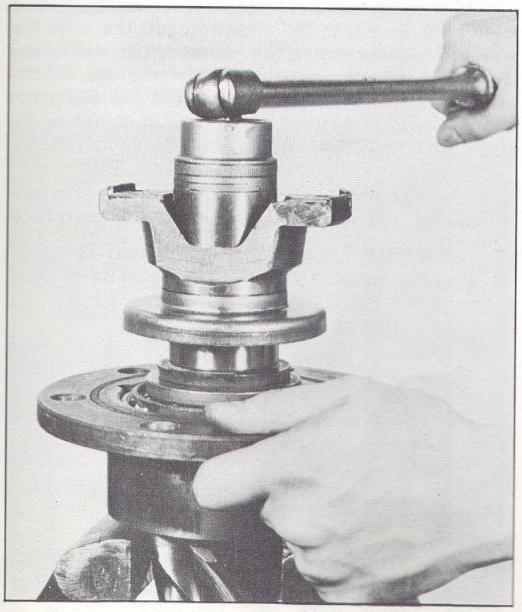


Fig. 11 - Tighten And Rotate Pinion Cage

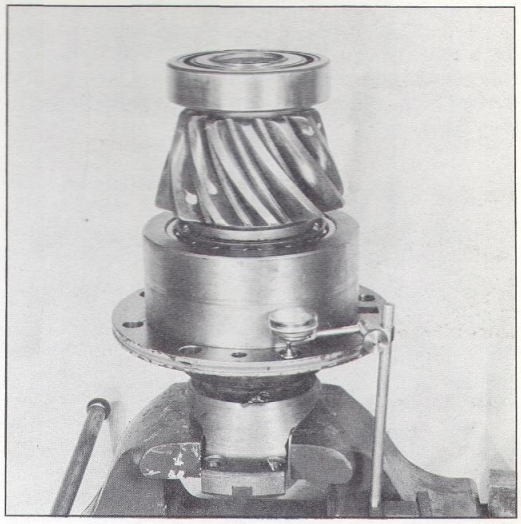


Fig. 12 - Checking Pinion Cage Inner Flange Face

2. Make sure cups (28) rest squarely upon bearing seat and shoulder. A .001'' feeler should not enter between bearing cup (28) and its seat.

3. Install the companion flange (46) and its nut (47), rotating the cage (40) both ways to align the rollers as the nut is tightened to 600 to 800 ft. lbs. of torque. See Figure 11.

If bearings (27-28) should start to seize as the nut (47) is being tightened, the assembly must be taken apart a sufficient amount to permit installation of spacers (29) which have a greater total thickness. Take care, the pressure could easily ruin the bearings. For this reason, when new parts are being installed, spacers having a greater total thickness than the originals should be used for the trial setup.

A dial indicator can now be used to be sure there is no existing end play in the cage bearings. The dial indicator should also be used to check the run-out of the cage at the O.D. of the bearing hub and the under (shim) side of the flange face. See Figure 12. The run-out should be held to within .004'' total indicator reading. If the run out is greater than .004'', the chances are that the bearing cups are not properly seated.

With the bearings lightly oiled, there should be a noticeable drag or pre-load on the pinion bearings when the flange nut is drawn up to the proper torque of 600 to 800 ft. lbs. The pre-load should be held within the torque range of 15 to 30 inch lbs.

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To check the torque, wrap several turns of soft wire around the body of the pinion cage and form a small loop at the free end. Insert the hook of a Kent Moore Spring Scale No. J-6983 into the wire loop and pull on a line parallel to the outer flange face, while holding the pinion shaft upright. See figure 13.

The scale reading in pounds should be taken when the cage is being rotated. The starting torque may be higher and therefore misleading, depending upon the tightness of the bearings.

The pull in pounds as indicated by the scale, times the cage body radius in inches (measured at point where wire was wrapped) gives the inch pounds of torque.

For example: If the cage body radius is 3-1/8" and the scale pull registered 10 lbs, 3.125 x 10= 31.250 inch pounds torque. This is $1\frac{1}{4}$" lbs. over the high limit. The bearing pre-load would be too great.

Continue checking the pre-load and changing spacers as required until the proper fit of 15 to 30 inches pounds is obtained, with the bearings and spacers under the full torque of 600 to 800 ft. lbs.

4. Install the pinion tail bearing and stake it in place. A steel ball or the ball end of a small ball peen hammer placed close to the bearing cone and struck sharply with a hammer will make a substantial lip to hold the tail bearing on the shaft.

5. Place the carrier (37) into position with the pinion bore upward. If the original carrier and cage (40) are being used, little if any change of shims will be necessary.

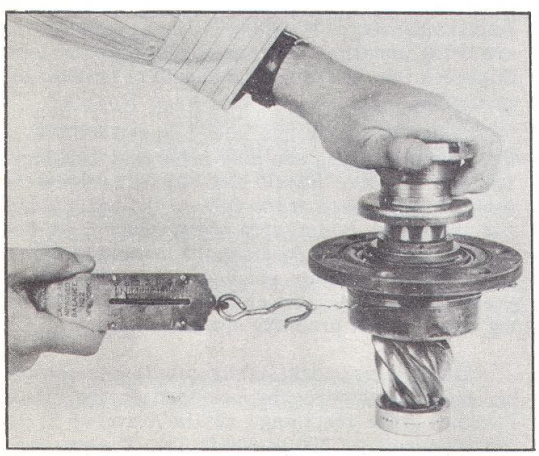

Fig. 13 - Checking Bearing Pre-Load With Tool J-6983

A manufacturing change has been made in the machining of the pinion shaft, in which .047" has been removed from the pinion end of the shaft. Where markings on older pinion shafts are similar to .005" or -.005", the new markings will always be plus and carry a larger number such as .052". The new marking may be just 52, in which case it must be considered as plus .052".

To bring the new marking into the same relationship with the old, subtract .047" from the new marking. The result will be a plus or minus number, which should be treated exactly as is the marking found on older pinions. All computations should be based on this low plus or minus number.

The standard shim pack is .030" thick. If a .005" number is etched on the pinion shaft or is the result of subtracting .047" from the etched dimension, that amount of shims should be added to the standard pack of .030". Conversely, if a negative number is etched on the shaft or is the result of subtracting .047", that amount should be removed from the standard pack. This adjusted shim pack should be approximately correct to give the proper tooth contact. Additional changes will probably be necessary to bring the pack to the final setting.

Since it is much easier to add or remove shim segments than full shims, it is recommended that a set of shims be cut into segments that can easily be added or withdrawn from the pack without completely removing the cage cap screws.

In positioning the shims on the carrier face, use care to match the shims to suit the cage and carrier cap screw holes. Make sure the shims are right side up, so as not to obstruct the oil return passage. A couple of guide screws will prove their worth in holding the shims and guiding the cage into its proper place

6. Line up the cage (40) and carrier (37) reference marks and slide the cage assembly into place.

7. Secure the assembly with at least two capscrews, equally spaced and drawn down tight.

BEVEL GEAR ASSEMBLY

1. Assemble the bevel gear (18) to the flanged case (20), using common bolts alternately placed and drawn down tight.

2. Assemble the bearing cones (5) to the case hubs, making sure each cone has been pressed tightly against the bearing shoulder.

3. Place the bearing cup (4) upon the open jaws of a vice and into this place the cage assembly, taking care that the lower part of the bearing cone (5) does not contact the vise jaws.

DIFFERENTIAL

A dial indicator should be used to properly check the back side of the bevel gear (18) for true running. With an easy motion, rotate the cage assembly and note the back face run out. This should be held to within .006'' total indicator reading. If the run out is more than .006'' try another position of the bevel gear (18) on the carrier (37). If the run out is still excessive, the defective gear and/or carrier should be discarded.

4. Mask the bearing for protection against grit and chips and install the special, ground bevel gear bolts, taking care that chips etc. do not lodge under the bolt heads. Install the nuts and draw down tight.

5. Remove the common bolts and install special bolts (22) and (24). Draw the nuts to full torque.

6. Place a thrust washer (8) and side gear (9) into the flanged case gear pocket.

7. Place a spider pinion (11) and cup shaped thrust washer (10) onto each spider arm and set the assembly into the flanged case (20), meshing the gear teeth so the spider arms fall into the sockets.

8. Position the other side gear (9) on the spider pinions (11) and then the thrust washer (8) upon the gear.

9. Locate the reference marks and assemble the plain case (7) to the flange case (20). Install the case capscrews (bolts and nuts, if used) and alternately draw to the proper torque.

10. Position the carrier (37) for convenient operation and install the thrust block adjusting screw (36), the nut (35), and the lock (34). Turn the adjusting screw in just far enough to enter the wear block (19), which is held in place with a little heavy grease.

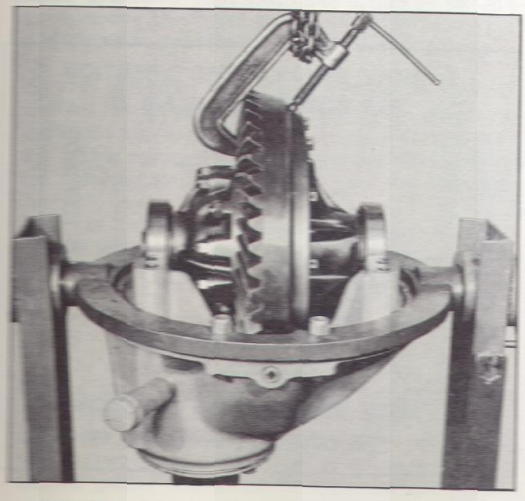

Fig. 14 - Lifting Out Differential Assembly

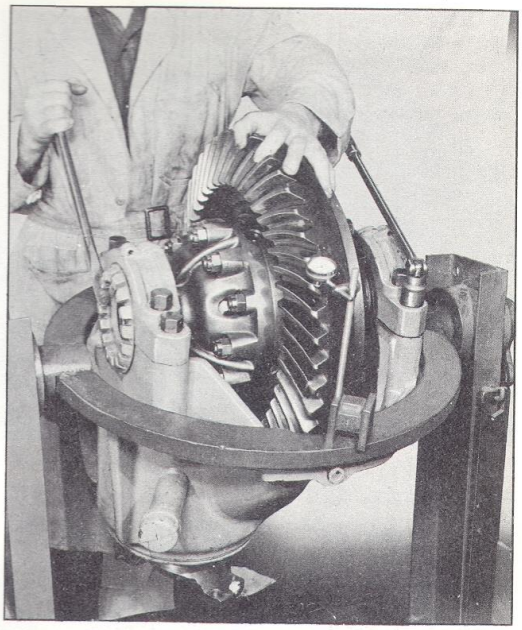

Fig. 15 - Checking Backlash

11. Lift bevel gear and case assembly with a hoist and, before setting it into position, see Figure 14, slide bearing cups (4) into place.

12. Install the dowel bushings (model 3910 only) and the side bearing caps (13), making sure the reference marks line up. Replace the cap screws (15).

13. Remove the hoist and turn down the capscrews (15) until the heads are close to the bearing caps.

14. Start the adjusters (3) into their respective places, taking care that the threads are not crossed.

ADJUSTMENT FOR BACKLASH & TOOTH CONTACT

1. Manipulate the adjusters (3) so as to bring the bevel gear (18) close to the pinion (26) and, at the same time, remove the excess bearing end play. As the above adjustments are being made, the capscrews (15) should be tightened just enough to allow snug movement of the adjusters.

2. The back lash should be brought to the number (such as .011'') that is etched upon the heel of the bevel gear tooth. A dial indicator should be used to check this movement. See Figure 15.

DIFFERENTIAL

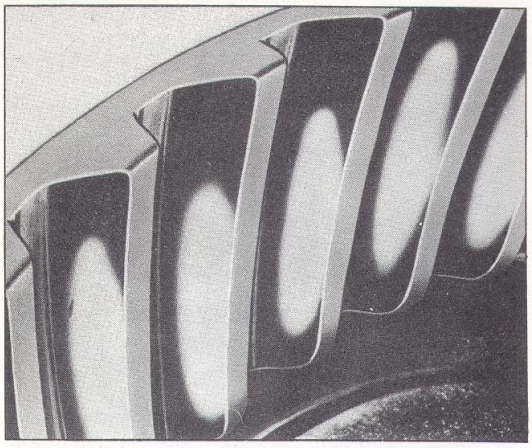

Fig. 16 - Correct Gear Tooth Wear Pattern

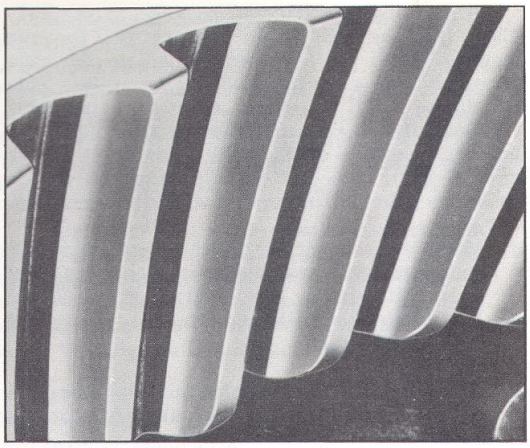

Fig. 19 - Pinion In Too Far - Add Shims

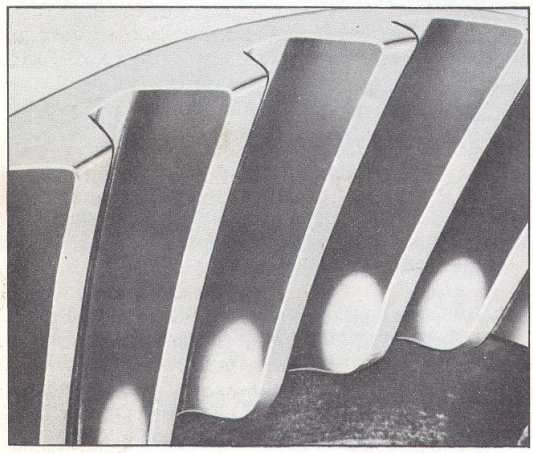

Fig. 17 - Not Enough Lash - Move Ring Gear Away From Pinion

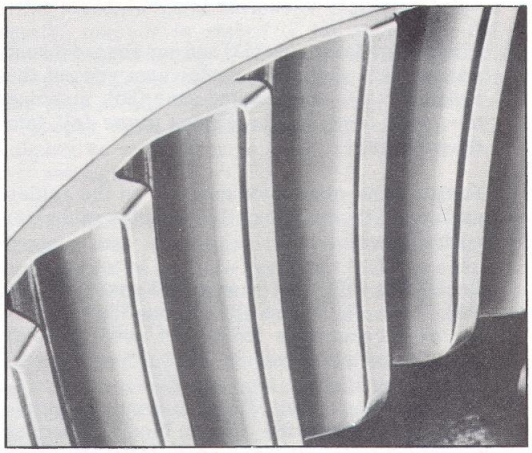

Fig. 20 - Pinion Out Too Far - Remove Shims

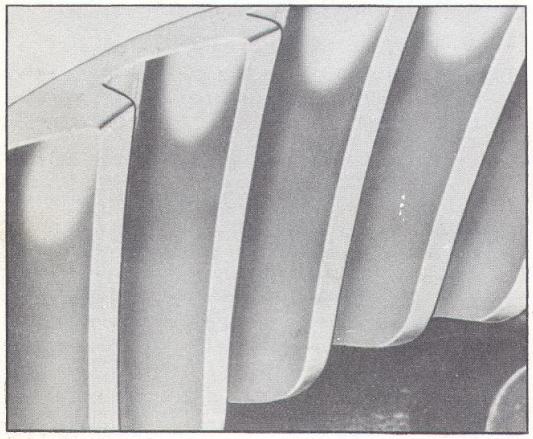

Fig. 18 - Too Much Lash - Move Ring Gear Toward Pinion

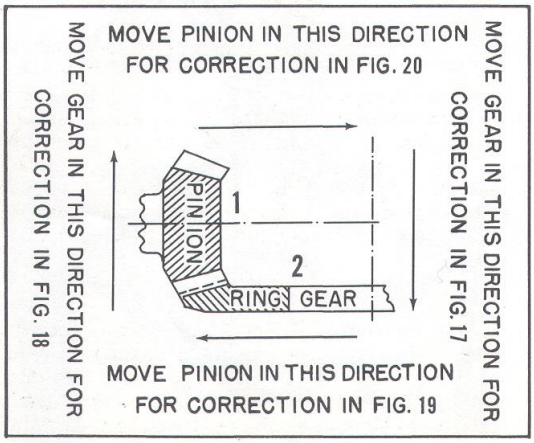

Fig. 21 - Correct Movement For Adjustments

DIFFERENTIAL

It is extremely important for long life and smooth operation of the gear set that the proper tooth contact pattern exists upon the drive side of the pinion and bevel gear teeth.

The first to be considered is the bearing pattern along the length of the tooth. It is controlled by the adjusters (3), which move the bevel gear (18) toward or away from the pinion (26). The second is the pattern from the top of the tooth to the tooth base, and it is controlled by moving the pinion (26) in or out by adding or removing shims (39) at the cage (40).

3. Paint about six of the gear teeth with a lead and oil mixture or prussian blue. Red lead and oil is the most descernable.

4. Wedge a piece of wood between the carrier and the smooth part of the circumference of the bevel gear and turn the pinion as it would rotate in the forward direction. The greater the load that can be imposed upon the gears and still permit rotation will result in a larger and a more distinct tooth contact pattern. If the pattern is not satisfactory, move the gears as indicated in the illustrations in Figures 16-20.

Figure 16 shows the proper tooth contact pattern.

Figure 17 shows that the profile is good, but the contact area is at the inner (toe end) edge of the bevel gear. To increase the lengthwise bearing area, move the bevel gear away from the pinion and remove shims to bring the pinion inward to maintain the proper backlash.

Figure 18 shows that the profile is good, but the contact area is at the outer (heel end) edge of the bevel gear. To increase the lengthwise bearing area, move the bevel gear toward the pinion and add shims to provide the proper backlash.

Figure 19 shows that the profile is poor and the contact line is at the root or base of the bevel gear tooth. To increase the profile, add shims to move the pinion outward and move the bevel gear toward the pinion to maintain the correct backlash.

Bear in mind that moving the pinion in or out affects the profile pattern and moving the position of the bevel gear controls the lengthwise contact area.

The amount of segments or shims used will depend entirely upon the tooth contact pattern. To change the shim thickness using the shim segments in addition to the basic shim pack, install two smooth or dog point set screws in the tapped puller holes in the cage flange. Loosen the cage capscrews several turns and withdraw the cage with puller screws, just enough to change the segments. The final check of the gear tooth pattern must be made when the backlash is properly set, no end play exists in the side bearings, and the bearing caps are securely tightened.

When the pattern is satisfactory, the segments can be removed and measured with a micrometer.

5. Remove the nut (47) companion flange (46) and cage (40) from the pinion shaft. DO NOT POUND ON FLANGE! If necessary remove it with a suitable bearing puller. Install required number of shims (39) as determined from measurement of segments and replace cage.

6. Install the cork seal (41) in its groove.

7. Assemble the oil seal retainer (44) to the companion flange (46), having first saturated the felt (43) in light engine oil. The retainer face should be coated with gasket cement. (Permatex No. 1 type sealer or its equivalent).

8. Reassemble the companion flange (46) and oil seal retainer (44) as an assembly.

9. Install the seal retainer bolts and lockwashers (45); replace the companion flange nut (47), and tighten to the required torque. Install the cotter pin (48).

10. Loosen the capscrews at the small side bearing (R.H.) and tighten the adjuster $1\frac{1}{2}$ to 2 notches past the snug position of the bearings. This will preload the side bearings. Draw all of the side bearing capscrews to full torque.

11. Install and cotter the adjuster locks (2).

12. Install the locking wires (16) at the bearing caps (13) and the case capscrews.

13. Adjust thrust block for .010'' to .015'' clearance and tighten lock nut (35). Bend the tangs on the lock (34) so that one tang engages the carrier (37) and the other locks the nut (35).

If the gear ratio has been changed, the ratio that is found stamped on the carrier (37) should also be changed.

Just before the carrier is slid into place on the banjo housing studs, coat the carrier and banjo housing faces with gasket cement (Permatex No. 1 type sealer or its equivalent).

14. Slide the carrier assembly into place.

15. Install the nuts on the studs and evenly draw to the proper torque.

DIFFERENTIAL

MAINTENANCE

PERIODIC INSPECTION

Regularly inspect companion flange nuts, pinion shaft nut, pinion cage cap screws, and differential stud nuts for tightness. On new units, tighten the stud nuts weekly until they "set" or show that they no longer need tightening. Keep the nuts tight to reduce the possibility of differential or drive line failure due to excessive vibration or wear. Replace any mounting studs which may have become broken or stripped.

Check the adjustment of the bevel gear wear block. The adjusting screw should be turned in until the bronze block contacts the bevel gear and then backed away 1/6 turn.

CAUTION: Never release the adjusting screw enough to permit the wear block to slip off the end of the adjusting screw. Make sure that tightening the lock nut does not change the adjustment. Bend one tang to secure the lock nut.

Jack-up the rear axle to test run the unit and listen for noises which might indicate the need for adjustment or replacement of worn parts. When doing this, lift both wheels off the ground. Excessive turning of one wheel damages the spider gears. If the differential is excessively noisy, it should be removed from the unit and disassembled for inspection.

LUBRICATION

The differential is splash lubricated with an extreme pressure lubricant. A fill plug is located in the top of the housing and a fill-level plug is located on the back.

Periodically the differential should be checked and filled with lubricant as recommended in the lubrication section. When the lubricant is checked, remove any chips or steel particles on the magnetic plug.

TORQUE REQUIREMENTS

Bearings - pinion shaft - 15 to 30 inches pounds

Nut - pinion shaft - 600 to 800 foot pounds

Nut - carrier to banjo housing stud - 140-150 foot pounds

Nut - bevel gear bolt - 135 to 160 foot pounds

Cap Screw - plain to flanged case - 100 to 125 foot pounds

Cap Screw - side bearing caps-225 to 250 foot pounds

TROUBLE SHOOTING

Noises and vibrations originating in the tires, transmission, planetaries, and drive lines are easily transmitted and may be erroneously attributed to the differential. Therefore, all possible sources of noise should be investigated before deciding that the differential must be taken apart.

Actual differential noises may be located by jacking up the rear of the unit so the tires are clear of the floor and then running the power train in fourth gear at a moderate engine speed. Be sure to jack up both rear wheels to prevent damage to the differential.

Whenever foreign noises such as a grating or rattle are heard coming from the differential, stop immediately. One broken tooth from a single gear can result in all the gears and bearing being chewed up if the unit is kept running. A good rule to remember is "When in doubt, check up; when sure, stop". That is, when the differential is defintely at fault, pull the drive axles before moving the unit a single foot.

TROUBLE	CAUSE	REMEDY
Vibration	Broken gear teeth	Replace damaged gear
	Excessive run-out on pinion or flanged cage	Disassemble and correct or replace that cage
Continual Noise	Bearings worn	Replace worn parts
	Gears damaged or worn	Replace gear

DIFFERENTIAL

TROUBLE	CAUSE	REMEDY
Noise on Drive	Ring and pinion gear adjustment tight	Readjust
Noise on Coast	Bearings damaged	Replace bearings
	Loose ring and pinion gear adjustment	Readjust Gears
	Excessive pinion gear end play	Readjust
Noise on Turns	Worn spider gears or side gears	Replace gears
Loss of Lubricant	Oil seals worn	Replace seal
	Loose nuts	Tighten nuts to correct torque
	Cracked Housing	Repair or replace housing

SPECIAL TOOLS

The following special tool is required for servicing this component:

Spring Scale	Tool No. J-6983	For Checking Pinion bearing preload adjustment

This tool can be ordered from your local Euclid dealer or directly from the Kent-Moore Organization whose address is:

KENT-MOORE ORGANIZATION
1501 South Jackson Street
Jackson, Michigan

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