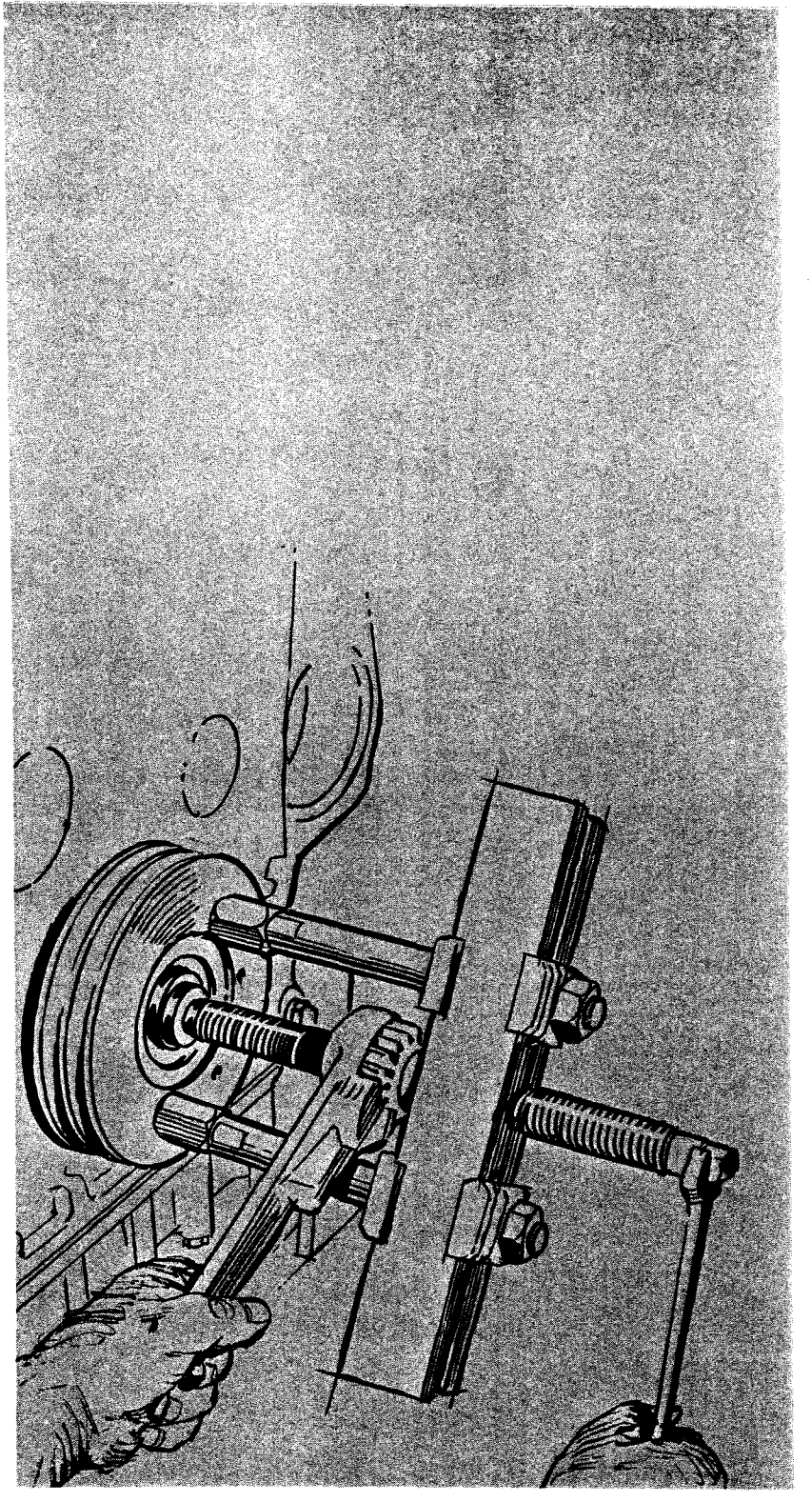


SERVICE MANUAL

DISASSEMBLY AND ASSEMBLY
950 POWER TRAIN

INTRODUCTION

This publication has instructions and procedures for the subject on the front cover. The information, specifications, and illustrations in this publication are on the basis of information that was current at the time this issue was written.

The "Alphabetical Index" is a list of all components and service operations in this manual section. It gives page numbers and also the operations numbers as found in the "Service Index".

The "Service Index" is a list of all component operations found in this manual section. All operations in the column "Component Operation" are removal and installation instructions, unless other descriptions are given for the operation. The arrangement of the components in this list is by location on the machine or engine. The column "Other Needed Operations" gives the number of all other component operations that are necessary to do the respective job.

Correct operation, maintenance, test and repair procedures will give this product a long service life. Before starting a test, repair or rebuild job, the serviceman must read the respective sections of the Service Manual, and know all the components he will work on.

Your safety, and the safety of others, is at all times very important. When you see this symbol  or this symbol  in the manual, you must know that caution is needed for the procedure next to it. The symbols are warnings. To work safely, you must understand the job you do. Read all instructions to know what is safe and what is not safe.

It is very important to know the weight of parts. Do not lift heavy parts by hand. Use a hoist. Make sure heavy parts have a good stability on the ground. A sudden fall can cause an accident. When lifting part of a machine, make sure the machine has blocks at front and rear. Never let the machine hang on a hoist, put blocks or stands under the weight.

When using a hoist, follow the recommendation in the manual. Use correct lift tools as shown in illustrations to get the correct balance of the component you lift. This makes your work safer at all times.

Make reference to GENERAL INSTRUCTIONS.

ALPHABETICAL INDEX

SERVICE INDEX

*Operation location in Engine Section of Disassembly and Assembly
**Operation location in Vehicle Systems Section of Disassembly and Assembly

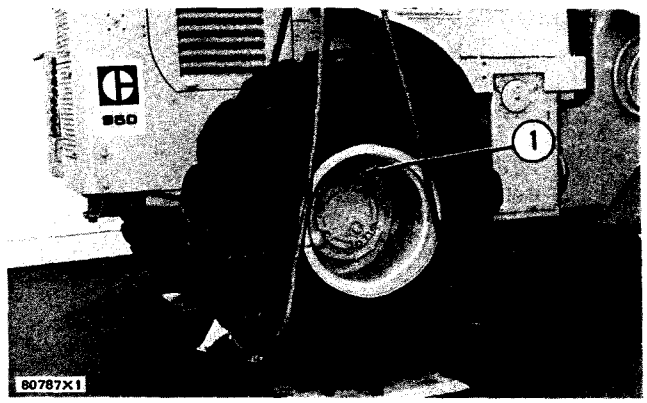
ALWAYS INSTALL LIFT ARM SUPPORT BEFORE WORKING UNDER RAISED LIFT ARMS OR BUCKET

DISCONNECT BATTERIES BEFORE PERFORMING SERVICE WORK

TIRES AND RIMS, DRIVE AXLES

REMOVE TIRES AND RIMS 11–4202

1. Lift the tire off the floor with a hoist or jack and put a stand under the axle housing as a support.
2. Connect a hoist to the tire.
3. Remove nuts (1).
4. Remove the tire and rim. Weight is 900 lb. (408 kg).

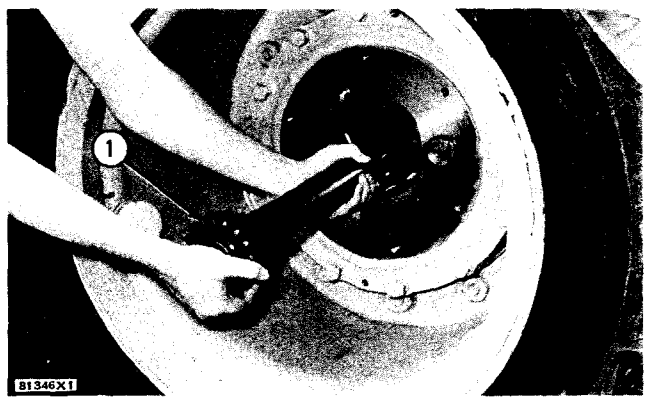


INSTALL TIRES AND RIMS 12–4202

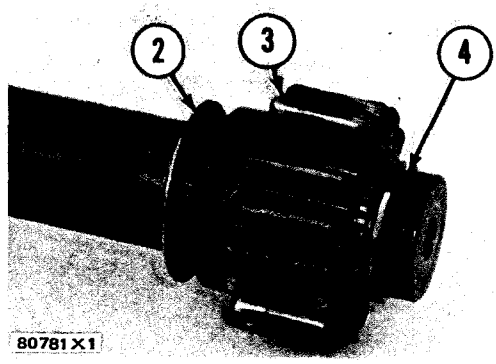
1. Put the tires and rim into position on the wheel studs with a hoist.
2. Install the nuts that hold the rim to the wheel. Tighten the nuts to a torque at 365 ± 50 lb.ft. (50.5 ± 6.0 mkg).

REMOVE DRIVE AXLES 11–3259

1. Remove the oil from the final drives.
2. Remove cover from final drive.
3. Pull the drive axle (1) out of the axle housing.



4. Remove ring (4), gear (3) and washer (2) from axle.



DRIVE AXLES, FINAL DRIVES

INSTALL DRIVE AXLES 12–3259

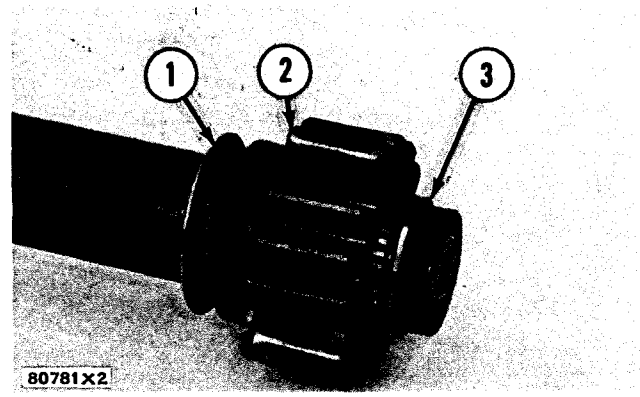
1. Install washer (1), gear (2) and ring (3) on axle.

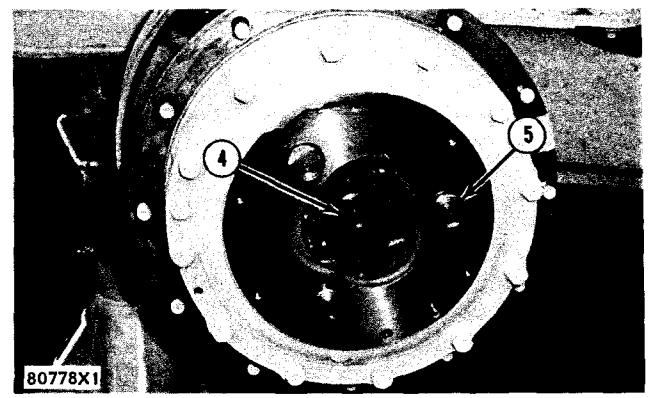
NOTE: Install steel side of washer (1) against gear (2).

2. Push the axle (4) into position in the differential and final drive.

NOTE: If needed turn wheel to get axle in alignment.

3. Turn notch in shafts (5) to the outside of carrier as shown.
4. Install the cover on the final drive.
5. Fill the final drives with oil to correct level. Tighten the fill plug to a torque of 75 ± 5 lb.ft. (10.4 ± 0.6 mkg).

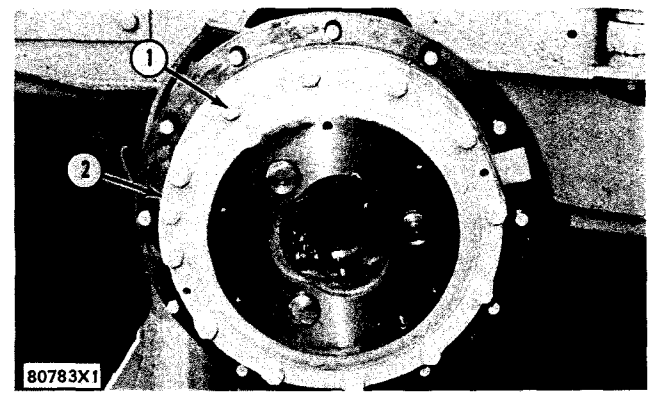




REMOVE FINAL DRIVES 11–4050

start by:
a) remove drive axles
b) remove tires and rims

1. Remove bolts (1) from the final drive.
2. Install a 1/2"–13NC forged eyebolt in the final drive and connect a hoist. Install two 1/2"–13NC forcing screws and remove final drive (2) from wheel. Weight is 90 lb. (41 kg).

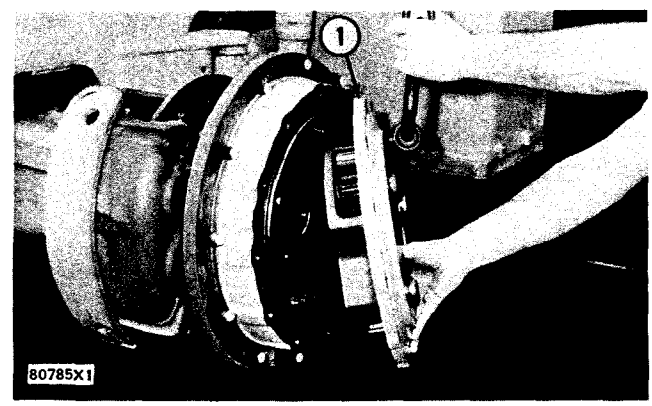


INSTALL FINAL DRIVES 12–4050

1. Put final drive (1) into position in the wheel with a hoist.

2. Install the bolts that hold the final drive to the wheel. Tighten to 195 ± 18 lb.ft. (26.9 ± 2.5 mkg).

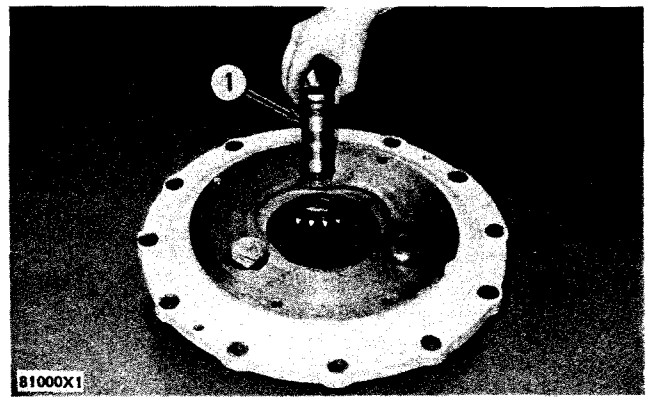
end by:
a) install tires and rims
b) install drive axles



FINAL DRIVES

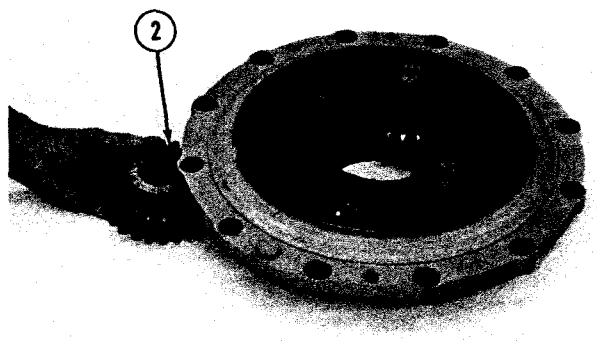
DISASSEMBLE FINAL DRIVES 15–4050

start by:
a) remove final drives



1. Lift the three shafts (1) out of carrier.

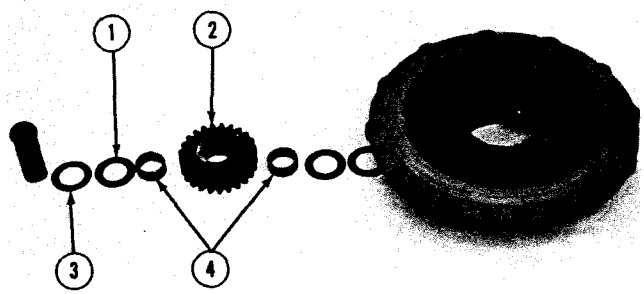
2. Remove the three gears (2), six steel washers, and six brass washers.



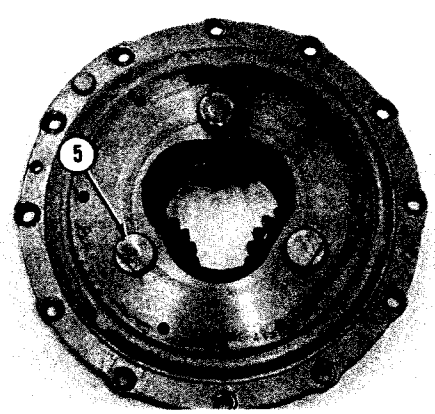
3. Remove the two bearing assemblies from each of the gears.

ASSEMBLE FINAL DRIVES 16–4050

1. Put the bearing assemblies (4) inside the gears.



2. Put the gears, steel washers, and brass washers in position in carrier assembly with the steel washers (1) next to the gears, and the brass washers (3) next to carrier.



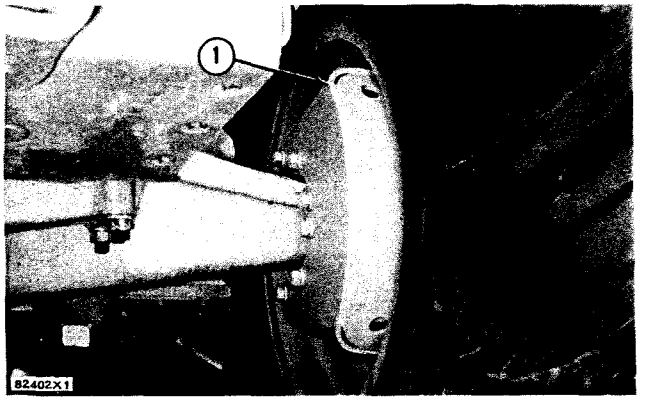
3. Install the three shafts (5) with the notch in each shaft to the outside of carrier as shown.

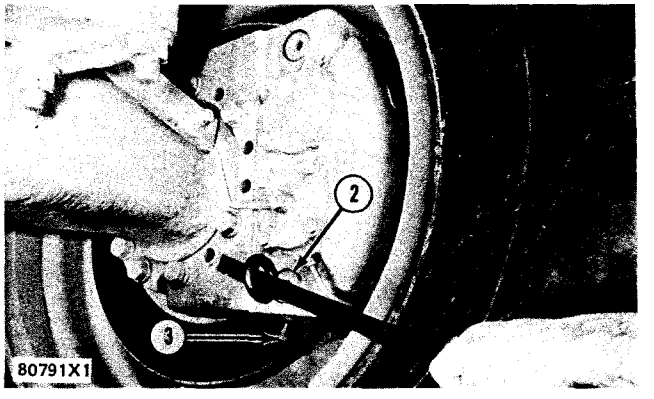
end by:
a) install final drives

WHEEL BRAKE LININGS

REMOVE WHEEL BRAKE LININGS 11–4254

1. Remove brake guard (1) and spacers between guard and axle housing.
2. Loosen bolts (3) from the end of brake head.
3. Install a 1/2"–13NC forged eyebolt in pin (2). Pull pin out far enough to remove inside brake lining.
4. Push outside pin away from disc far enough to remove outside lining.
5. Remove the brake linings.

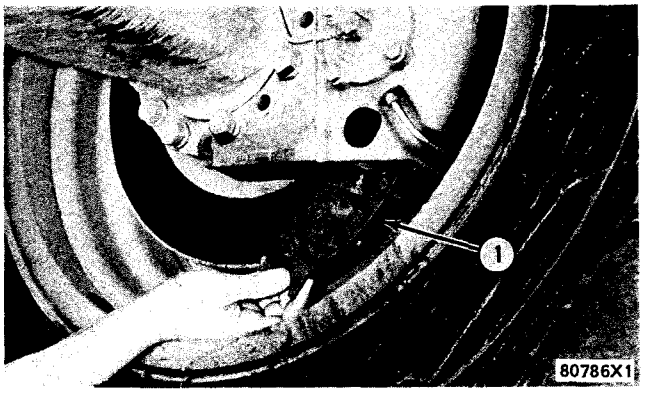


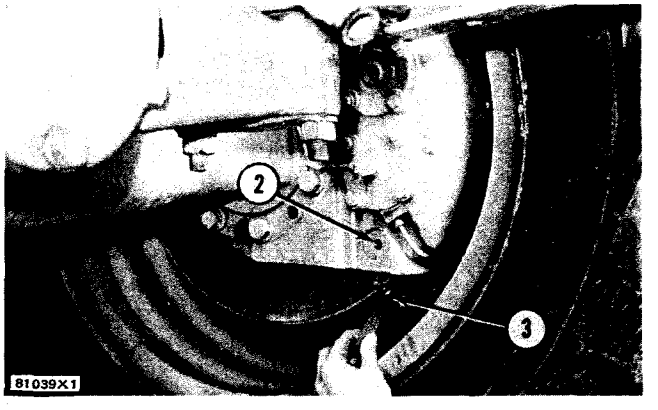


INSTALL WHEEL BRAKE LININGS 12–4254

Tools Needed		A
9S9149	Wrench	1

1. Push the brake pistons into the brake. This gives clearance for the new brake linings.
2. Put linings (1) into position on the upper pins in the brake.
3. Install pins (2).
4. Check the distance between the pins and disc with a thickness gauge (3). This distance must not be less than 0.10 in. (0.25 mm). Move the pins (2) in or out to provide the clearance.
5. Tighten the bolts that hold the pins.
6. Make several applications of the brakes to give the brake pistons a good seat against the brake linings.
7. Install the brake guard and spacers. Tighten the bolts to a torque of 225 ± 25 lb.ft. (31.1 ± 3.5 mkg).





WHEEL BRAKES

REMOVE WHEEL BRAKES 11–4256

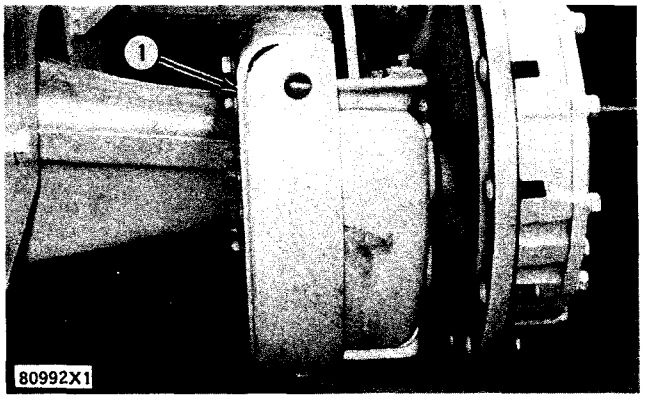
start by:
a) remove tires and rims

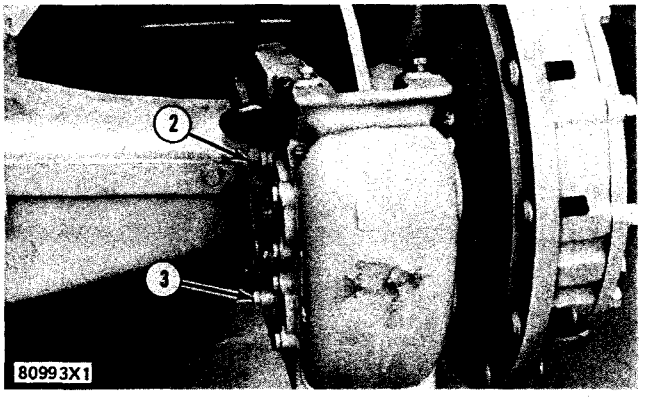
1. Remove brake guard (1) and spacers.

2. Disconnect brake line (3).

3. Install a 1/2"–13NC forged eyebolt in the brake and connect a hoist.

4. Remove bolts (2). Remove brake. Weight is 80 lb. (35 kg).





INSTALL WHEEL BRAKES 12–4256

Tools Needed		A
9S9149	Wrench	1

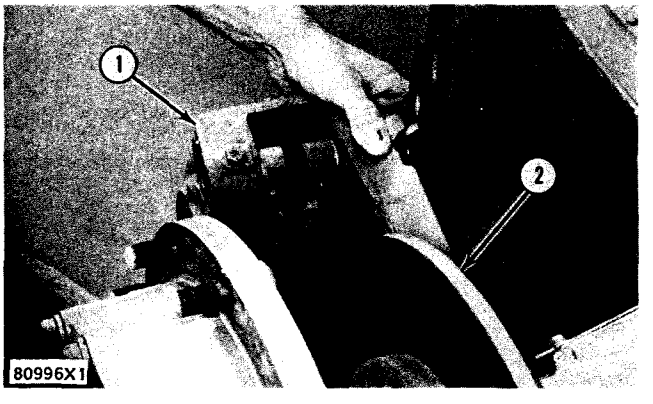
1. Connect a hoist and put the brake (1) in position on disc (2).

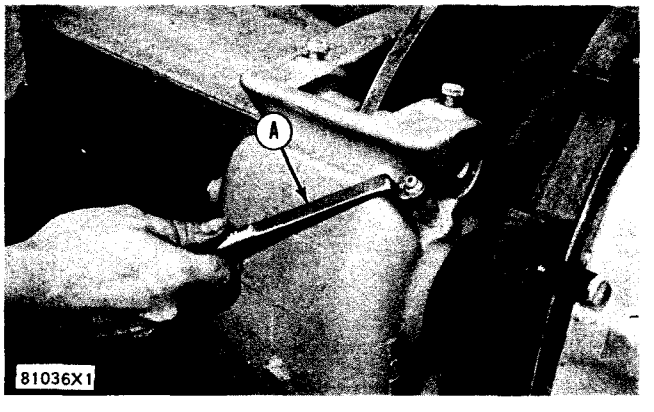
2. Install the bolts that hold the brake to the axle housing. Tighten bolts to a torque of 225 ± 25 lb.ft. (31.1 ± 3.5 mkg).

3. Connect the brake line to the brake.

4. Let the air out of the brake system with tool (A). See BLEEDING THE BRAKES in TESTING AND ADJUSTING.

end by:
a) install tires and rims



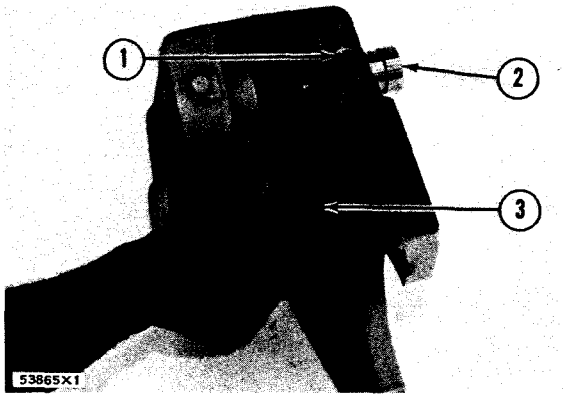


WHEEL BRAKES

DISASSEMBLE WHEEL BRAKES 15–4256

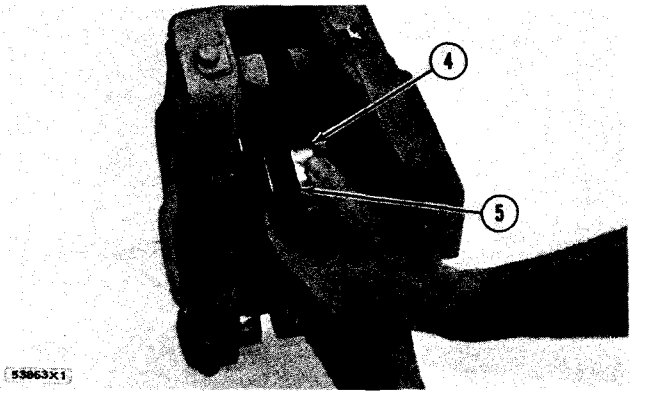
start by:
a) remove wheel brakes

1. Loosen bolts (1). Pull the pin (2) out and remove brake linings (3).



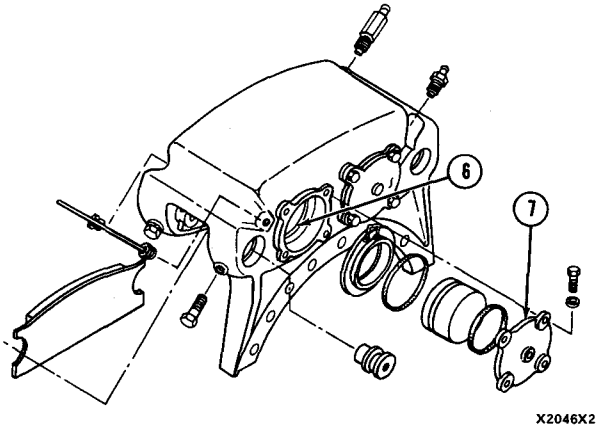
2. Remove caps that hold two of the pistons in the brake.

3. Remove four pistons (4) and boots (5) from brake.



4. Remove seals from the piston bores (6) in the brake.

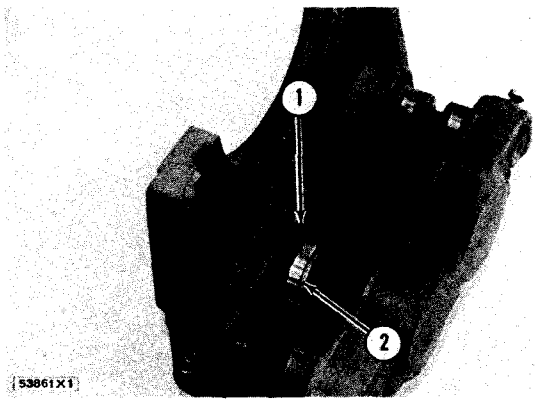
5. Remove O-ring seals from the caps (7).



WHEEL BRAKES

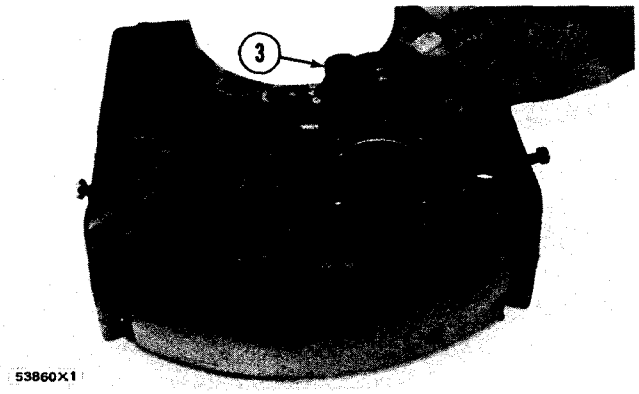
ASSEMBLE WHEEL BRAKES 16–4256

1. Install a new seal in the four piston bores of the brake.

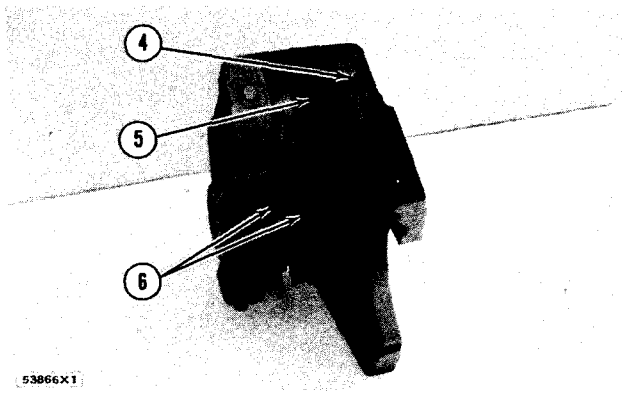


2. Install boots (1) in the piston bores with the lip of the boot in the groove of the bore.

3. Install the four pistons in the bores of the brake through boots (1). Put the lip of the boot (1) in position in the groove in the pistons (2).



4. Install a new O-ring seal on caps (3). Install the caps.



5. Install the brake linings (6) and pin (5). Tighten bolt (4).

end by:
a) install wheel brakes

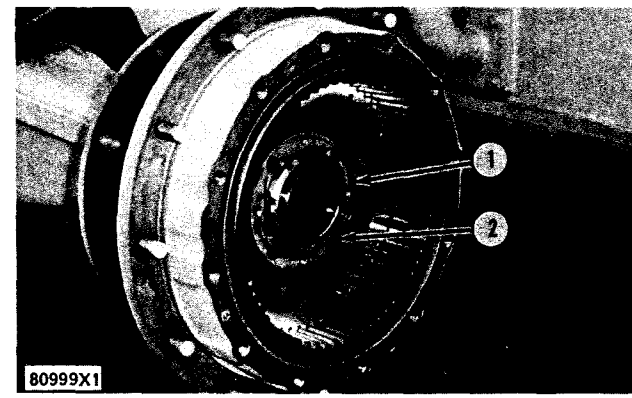
WHEELS

REMOVE WHEELS

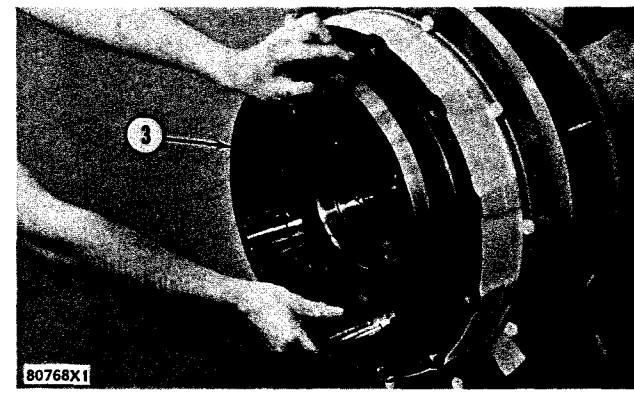
Tools Needed		A	B
FT528	Spanner Wrench	1	
1P531	Handle		1
1P516	Drive Plate		1

start by:
a) remove final drives
b) remove wheel brakes

1. Remove lock wire, bolts (2) and lock (1).

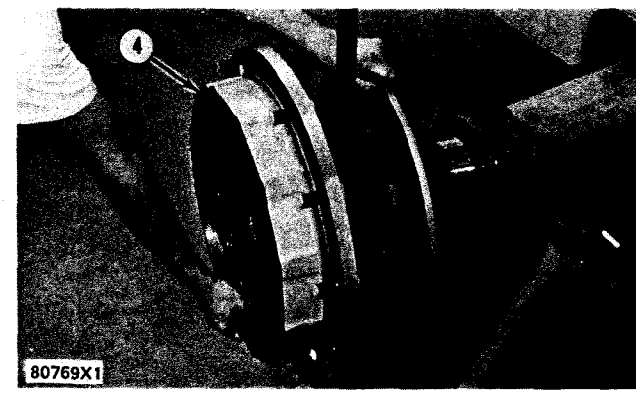


2. Connect a hoist to the wheel.



3. Remove nut from wheel with tool (A).

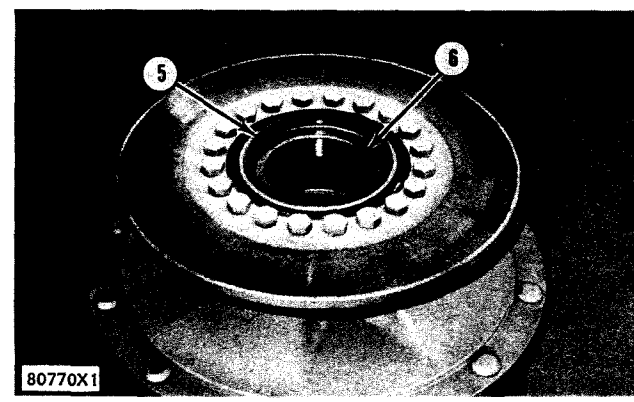
4. Remove the hub (3) from the wheel. Weight is 65 lb. (29 kg).



5. Remove wheel (4). Weight is 180 lb. (82 kg).

6. Remove Duo-Cone seal (5) and retainer from wheel.

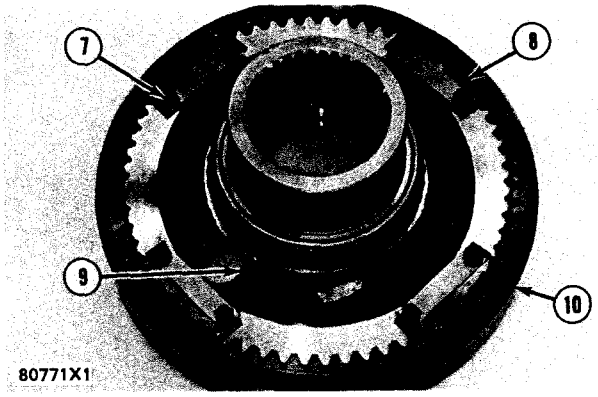
NOTE: The seal retainer must be removed evenly or damage to retainer will result.



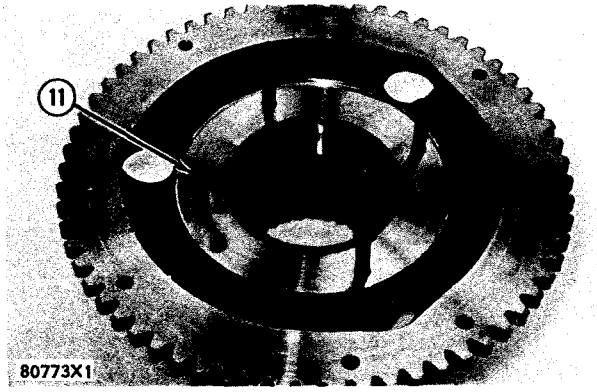
7. Remove inner bearing cone (6) from wheel.

WHEELS

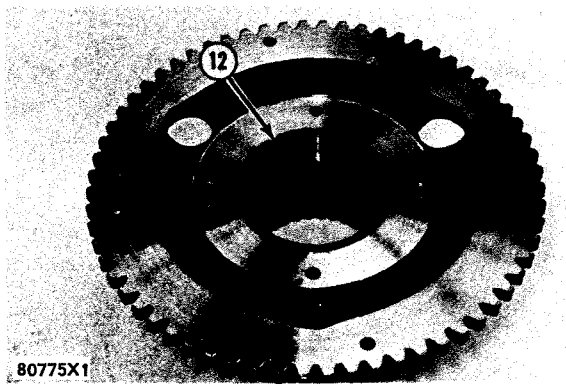
8. Remove bolts (7), locks, and plates (8) that hold ring gear to the hub.



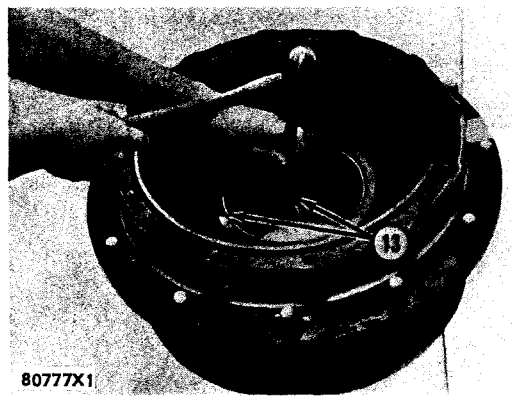
9. Remove the ring gear (10) from the hub (9).



10. Install four 3/8"–16NC, 2 in. long bolts (11) in the hub (9).



11. Remove bearing cone by tightening bolts (11).



12. Remove bushing (12) with tool (B).

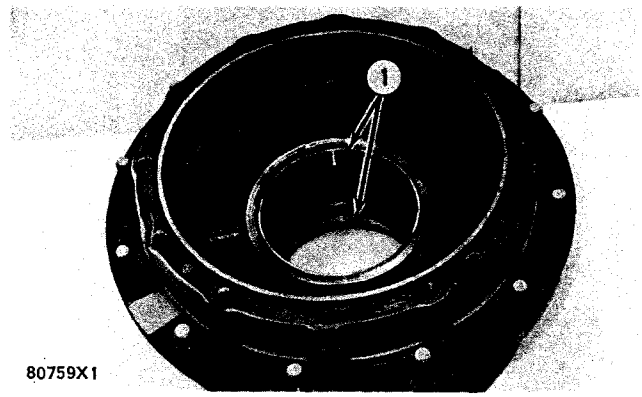
13. Remove bearing cups (13) with a hammer and punch.

WHEELS

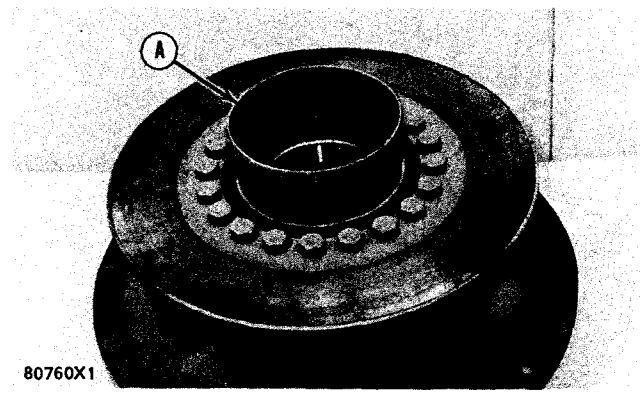
INSTALL WHEELS 12–4208

Tools Needed		A	B	C
2S8027	Installer	1		
1P531	Handle		1	
1P524	Drive Plate		1	
1P514	Drive Plate		1	
FT528	Spanner Wrench			1

1. Install the bearing cups (1) in the wheel.

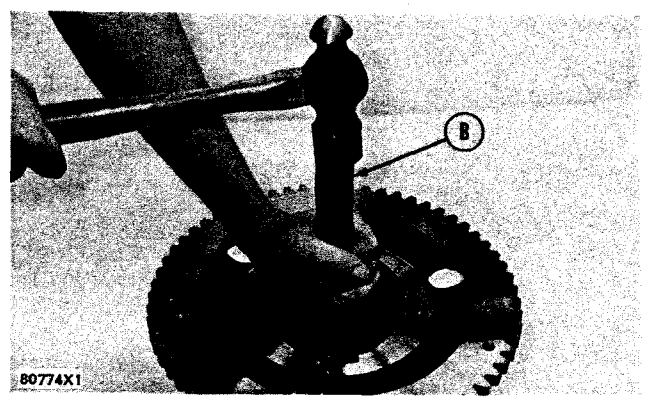


2. Install inner bearing cone and seal retainer.



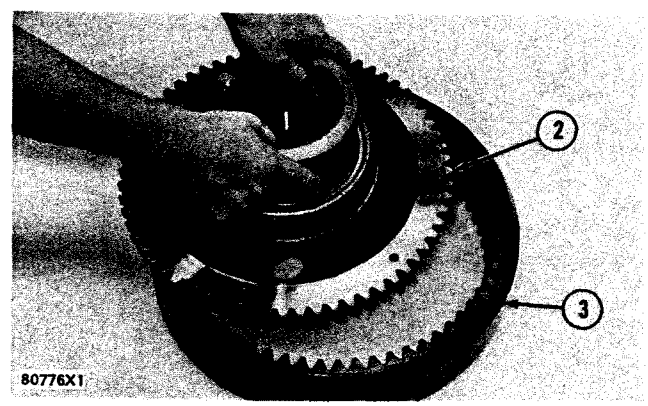
3. The rubber seal and the metal ring that makes contact with it must be clean and dry. Put a small amount of SAE 30 oil on the outside surface of the metal seal ring that does not make contact with the rubber seal. Install the Duo-Cone seal in the wheel with tool (A).

4. Install the bushing in the hub with tooling (B).



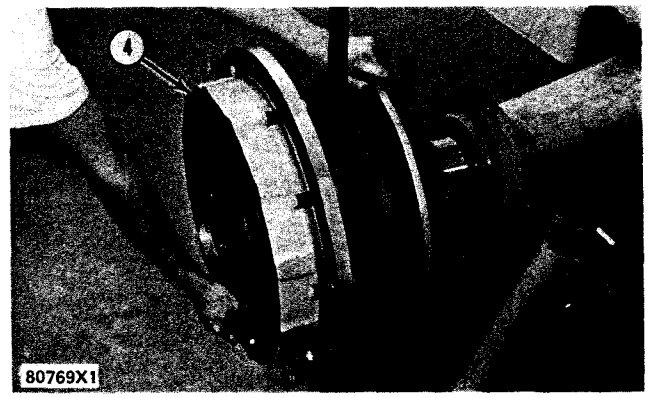
5. Put the bearing cone of the hub in oil with a temperature of 275°F (135°C). Install the bearing cone on the hub.

6. Put the hub (2) in position on the ring gear (3) and install the plates, locks and bolts.



WHEELS

7. Put the wheel (4) in position on the spindle with a hoist.



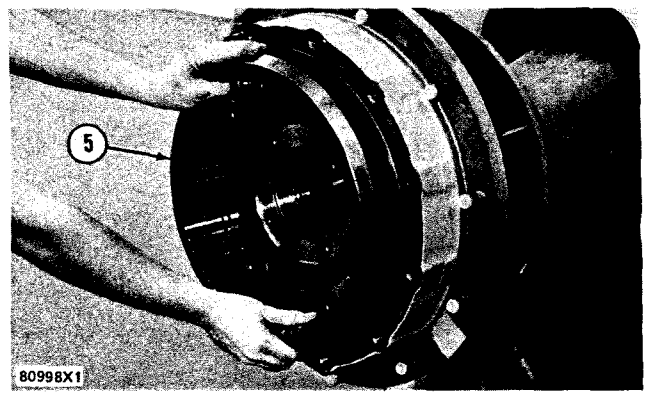
8. Install hub (5) in the wheel.

9. Install nut (6) on the spindle.

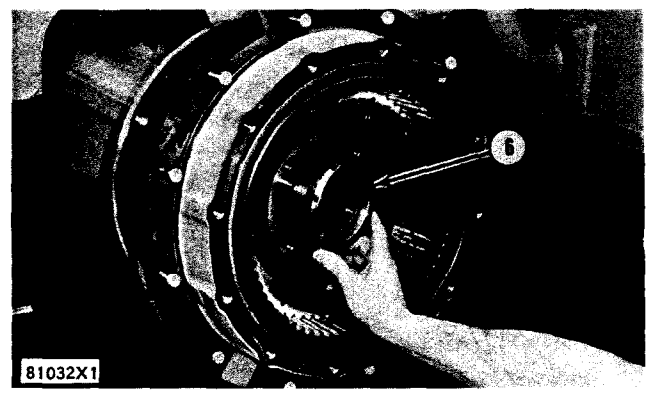
10. Tighten nut with tool (C) while turning the wheel with a 8 inch long 18 in. torque wrench (9S7354). The torque must be 44 to 88 lb.in. (50.7 to 101.5 cm.kg). For other lb.in. torque wrenches, the correct torque reading can be found by using this formula:

$$C = \frac{A \times T}{A + B}$$

C is the torque wrench reading.
A is the length of torque wrench.
B is the distance from center of axle housing to wheel nuts.
T is torque to turn wheel.
T = 100 to 200 lb.in. (115.3 to 230.6 cm.kg).



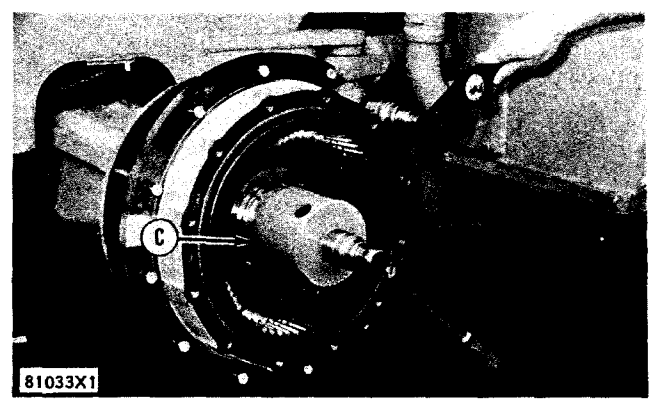
NOTE: The torque wrench must be installed on wheel nut so it is in line with the center of the wheel as shown.



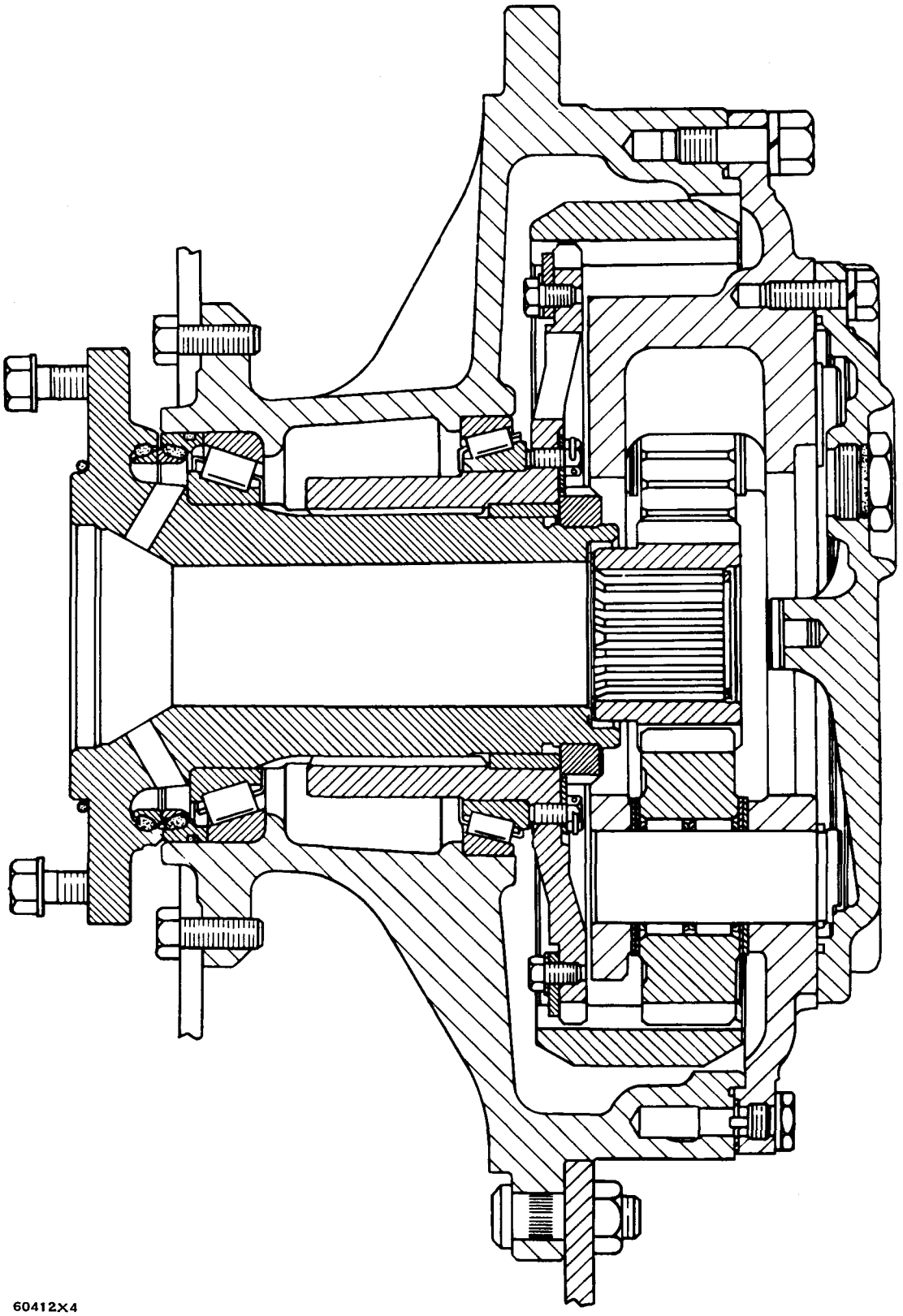
11. Turn wheel slowly at a constant speed for one or two turns to check torque reading after adjustment has been made.

12. Install lock on nut. Tighten nut more if needed to get lock in alignment with bolt holes. Install bolts and lock wire.

end by:
a) install final drives
b) install wheel brakes



FINAL DRIVE AND WHEEL



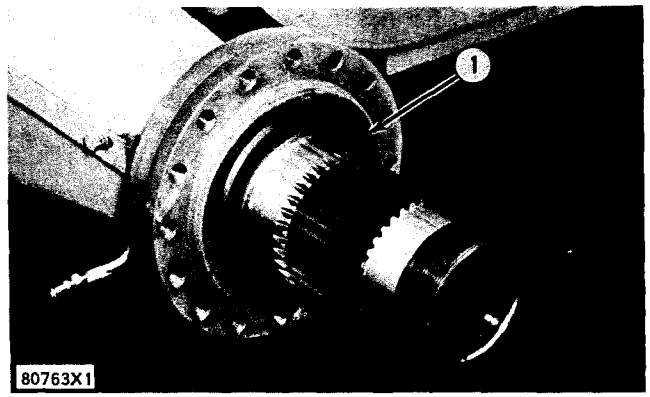
60412X4

FINAL DRIVE DUO-CONE SEALS, WHEEL BRAKE DISCS

REMOVE FINAL DRIVE DUO-CONE SEALS 11–4209

start by:
a) remove wheels

1. Remove Duo-Cone seal (1) from spindle and wheel.

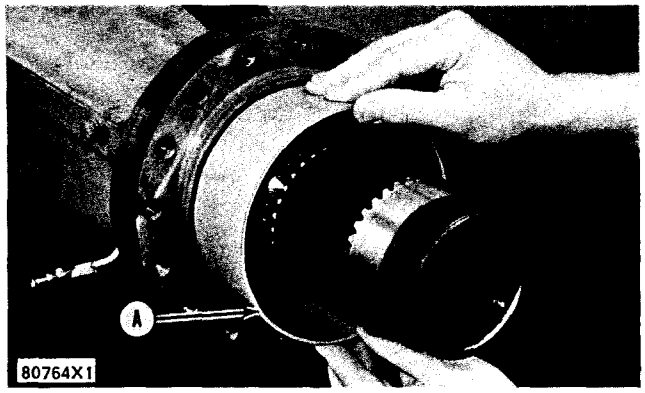


INSTALL FINAL DRIVE DUO-CONE SEALS 12–4209

Tools Needed		A
2S8027	Duo-Cone Seal Installer	1

1. The rubber seals and metal rings that make contact with the rubber seals must be clean and dry before assembly. Put a small amount of SAE 30 oil on the outside surface of the metal seal rings that contact each other.
2. Install Duo-Cone seal on spindle and wheel with tool (A).

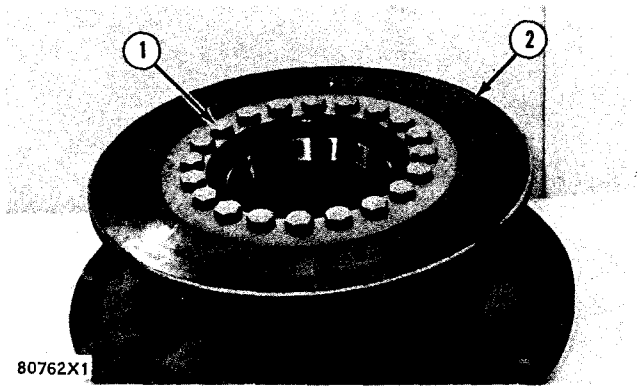
end by:
a) install wheels



REMOVE WHEEL BRAKE DISCS 11–4255

start by:
a) remove wheels

1. Remove bolts (1).
2. Remove disc (2).

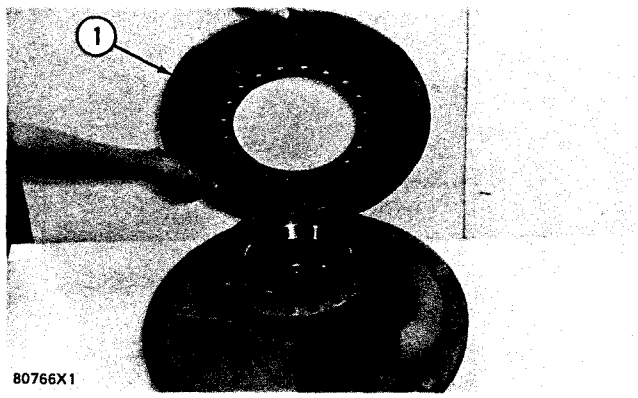


INSTALL WHEEL BRAKE DISCS 12–4255

1. Put the disc (1) in position on the wheel and install the bolts that hold it to the wheel.
2. Tighten 5/8" bolts to a torque of 195 ± 20 lb.ft. (27.0 ± 2.8 mkg). Tighten 1/2" bolts to a torque of 95 ± 20 lb.ft. (13.1 ± 2.8 mkg).

NOTE: A machine can be equipped with 5/8" or 1/2" bolts in brake discs.

end by:
a) install wheel

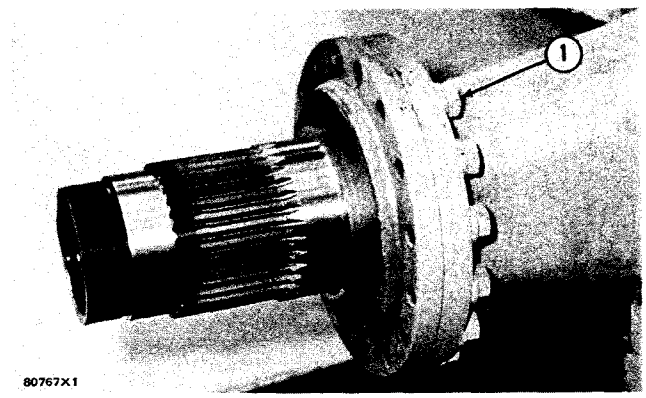


WHEEL SPINDLES

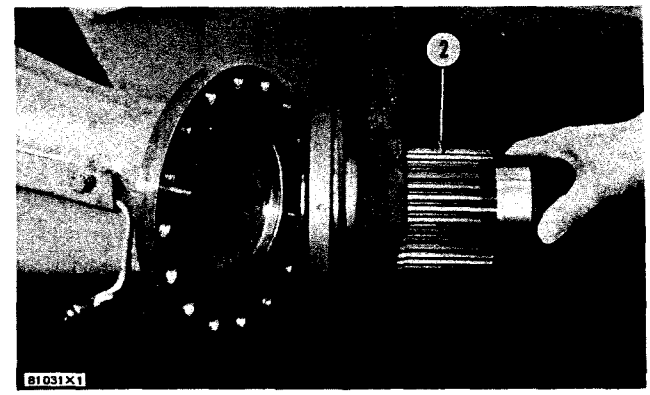
REMOVE WHEEL SPINDLES 11-4205

start by:
a) remove final drive Duo-Cone seals

1. Remove bolts (1) that hold the spindle to the axle housing.



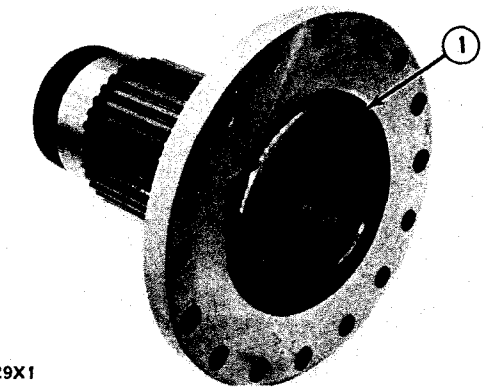
2. Remove the spindle (2).



3. Remove O-ring seal from spindle.

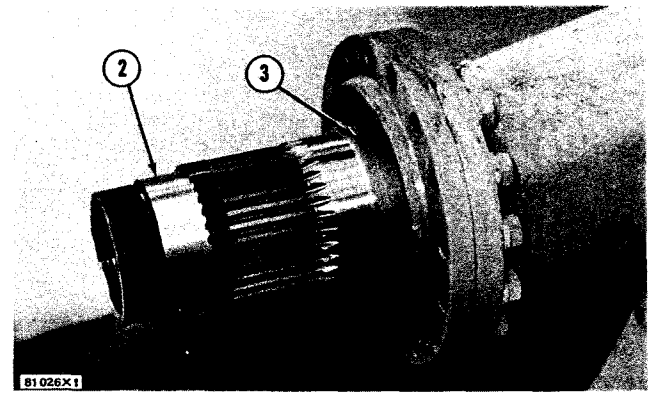
INSTALL WHEEL SPINDLES 12-4205

1. Put a new O-ring seal (1) on the wheel spindle.



2. Put the spindle (2) on the axle housing with the oil hole (3) in the vertical position. Install the bolts that hold the spindle on housing. Tighten the bolts to a torque of 225 ± 25 lb.ft. (31.1 ± 3.5 mkg).

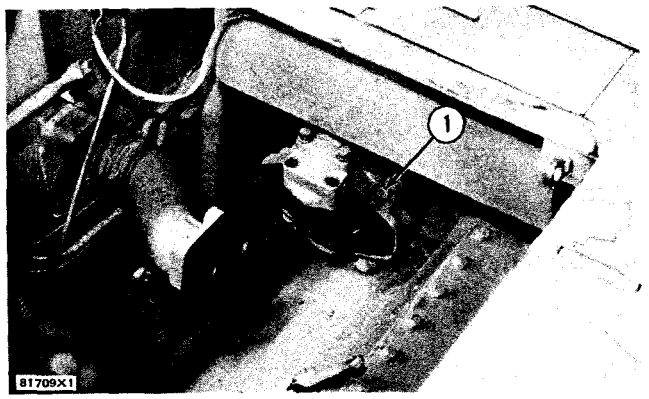
end by:
a) install final drive Duo-Cone seals



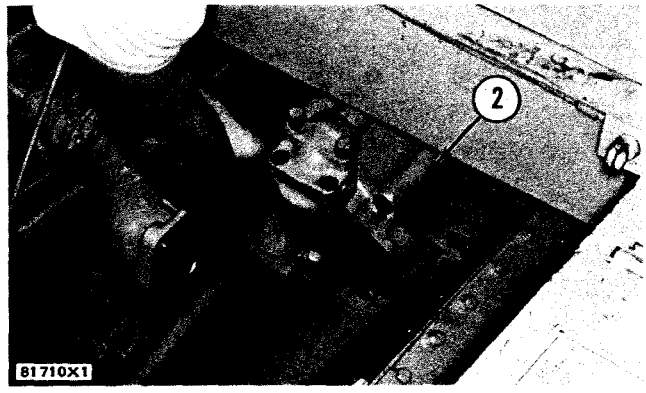
TRANSMISSION OIL PUMP

REMOVE TRANSMISSION OIL PUMP 11–3066

start by:
a) remove supplemental steering diverter valve
b) remove hydraulic pump



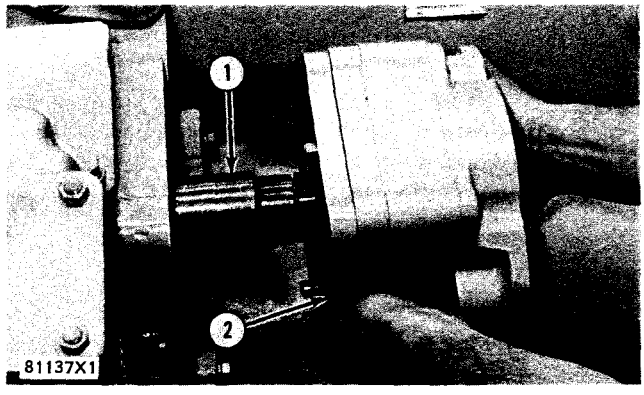
1. Remove four bolts (1) that hold the pump to the transmission.



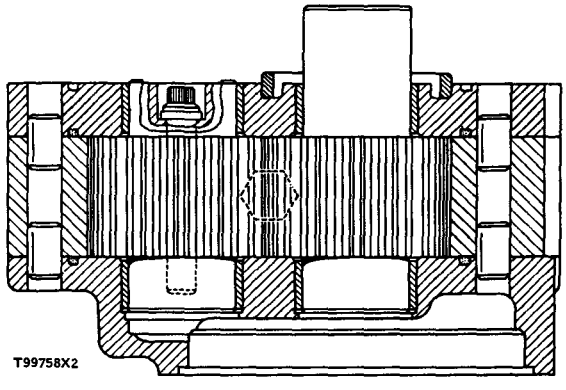
2. Remove pump (2) and spacer from transmission.

INSTALL TRANSMISSION OIL PUMP 12–3066

1. Install spacer (1) on pump (2).



2. Put spacer and pump in position on transmission.



3. Install bolts that hold pump to transmission.

end by:
a) install hydraulic pump
b) install supplemental steering diverter valve

FRONT DRIVE SHAFT AND SUPPORT BEARING

REMOVE FRONT DRIVE SHAFT AND SUPPORT BEARING 11--C--3267

start by:
a) remove transmission guard

1. Remove front guard.

2. Disconnect universal joint from parking brake flange.

3. Disconnect universal joint (5) from yoke at the support bearing.

4. Remove drive shaft (3) from machine.

5. Disconnect universal joint from drive shaft at the front differential.

6. Disconnect lubrication line (1) from support bearing.

7. Remove yoke (4) from front drive shaft.

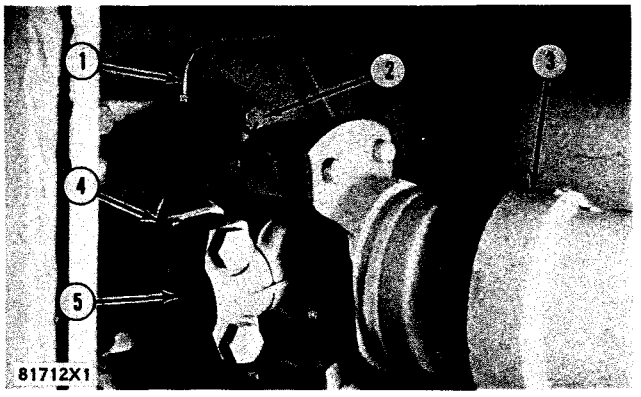
8. Remove four bolts (2) from retainer.

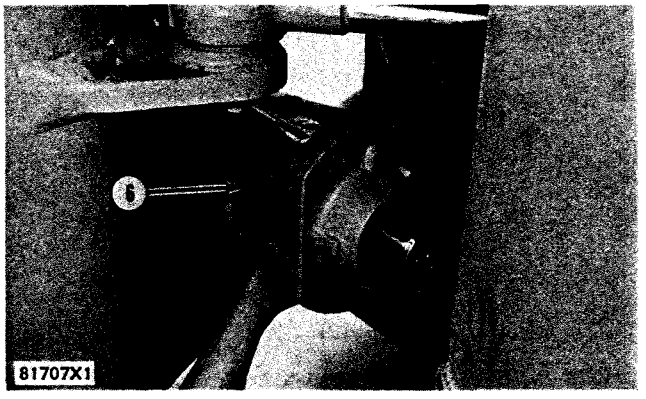
9. Remove drive shaft (6) and support bearing as a unit.

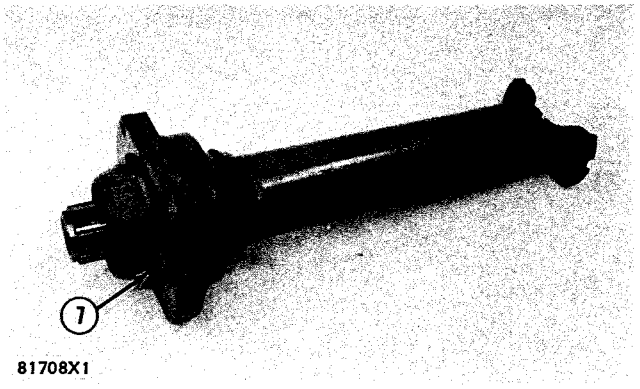
10. Remove two bolts (7) from cover.

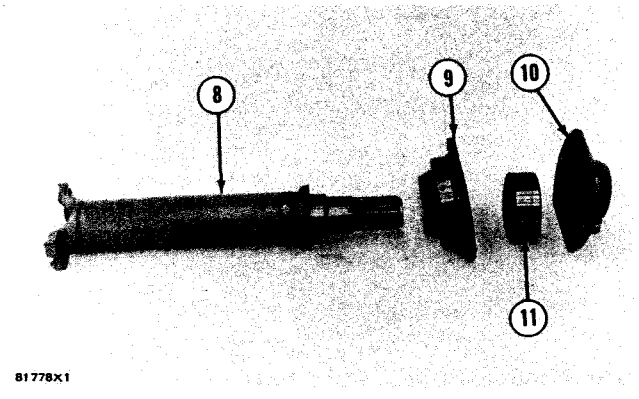
11. Remove shaft (8) from retainer (9), bearing (11), and cover (10).

12. Remove seal from retainer and cover.





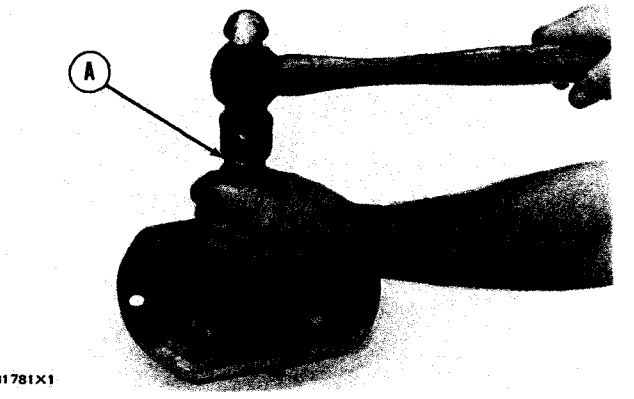




FRONT DRIVE SHAFT AND SUPPORT BEARING

INSTALL FRONT DRIVE SHAFT AND SUPPORT BEARING 12--C–3267

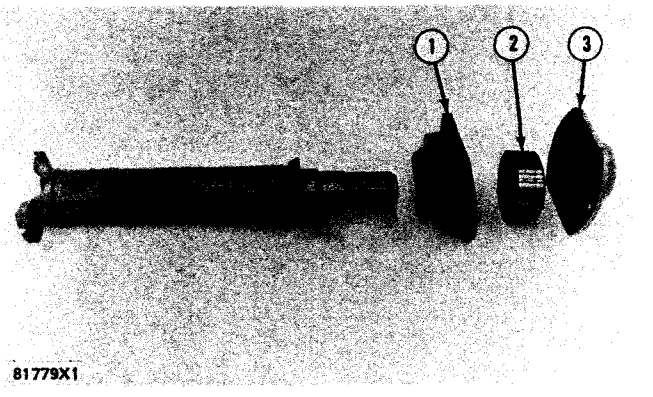
Tools Needed		A
1P531	Handle	1
1P513	Drive Plate	1



81781X1

1. Install seals in the cover and retainer with tooling (A). The lip of the seals must be toward the outside.

2. Install the retainer (1), bearing (2), and cover (3) on drive shaft.



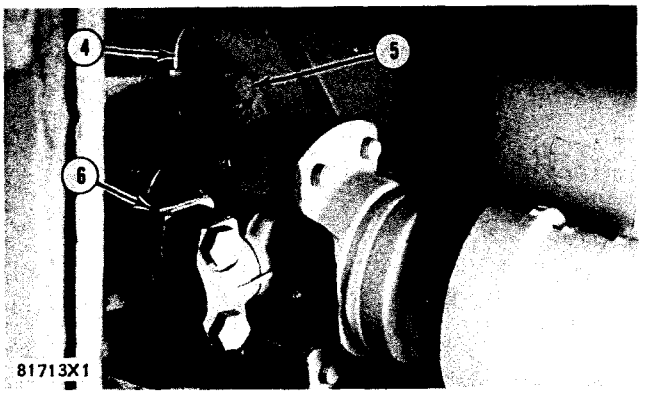
81779X1

3. Install the two bolts that hold cover to retainer.

4. Install the drive shaft and bearing in machine as a unit.

5. Install four bolts (5) that hold the retainer to the frame.

6. Install yoke (6) and yoke retainer.



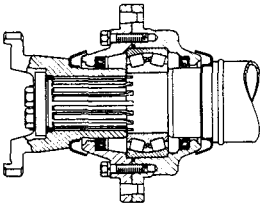
81713X1

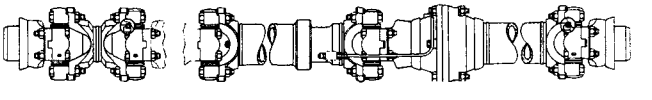
CAUTION: Install yoke so it is in alignment with yoke on the opposite end of drive shaft.

7. Connect lubrication line (4) to support bearing.

8. Connect universal joint to front differential.

T80503X2





9. Install drive shaft and connect front universal joint to yoke at the support bearing. Connect rear universal joint to parking brake flange. Tighten bolts in universal joints to a torque of 98 ± 10 lb.ft. (13.6 ± 1.4 mkg).

10. Install front guard.

end by:

a) install transmission guard

PARKING BRAKE

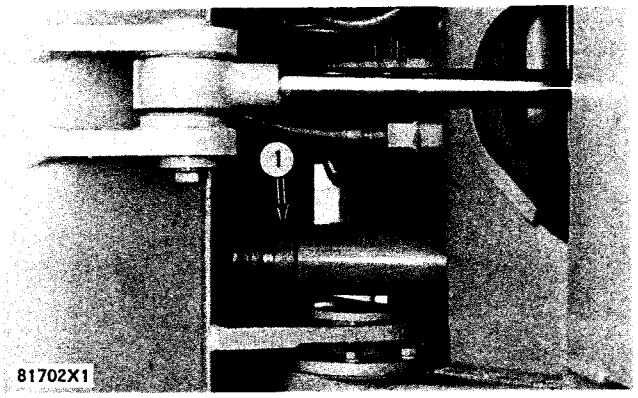
REMOVE PARKING BRAKE 11–4267

start by:
a) remove transmission guard

1. Release air pressure from the system.

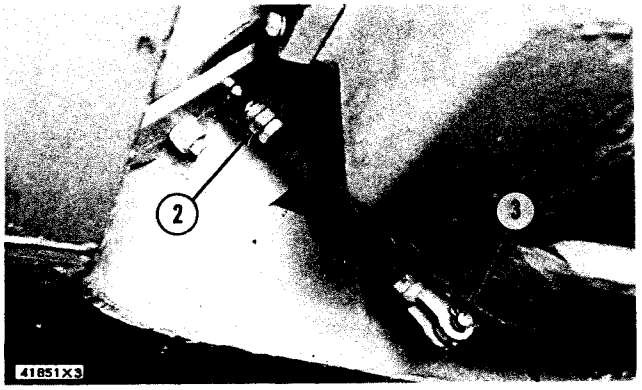
2. Remove the oil from the transmission.

3. Remove drive shaft (1).



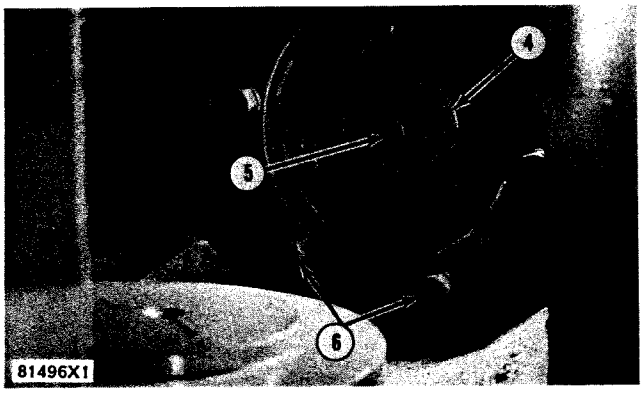
4. Loosen the parking brake by loosening nuts (2) on the rod until pin (3) is loose.

5. Remove pin (3) from rod.



6. Remove the two lower bolts (6) and two upper bolts that hold the brake drum to flange.

7. Remove bolt (5), retainer (4) and seal from flange.

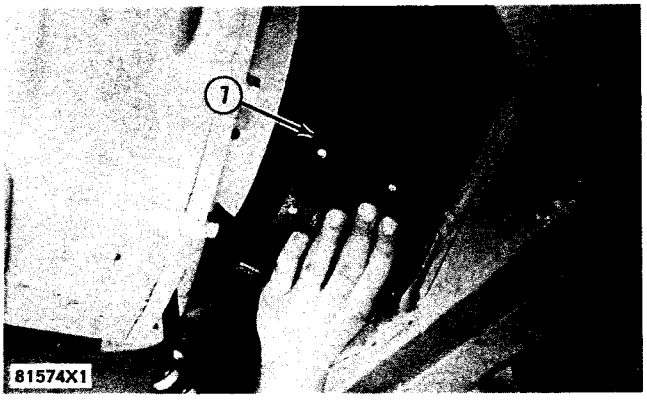


8. Move the brake drum and flange all the way forward as a unit.

9. Remove the four bolts that hold the brake shoe assembly to the retainer.

10. Remove the brake lever from behind brake shoes.

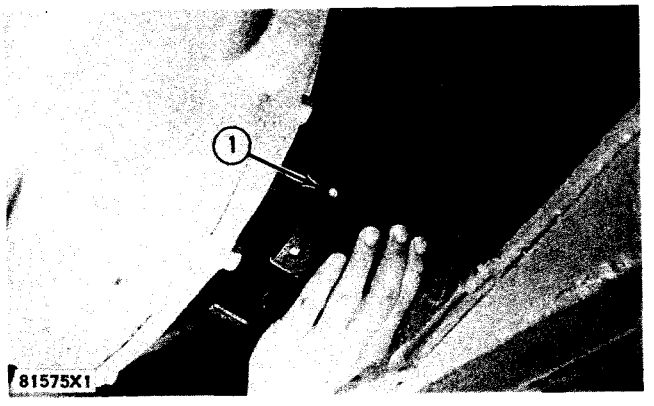
11. Remove the brake shoe assembly (7) by lowering it out the bottom.



PARKING BRAKE

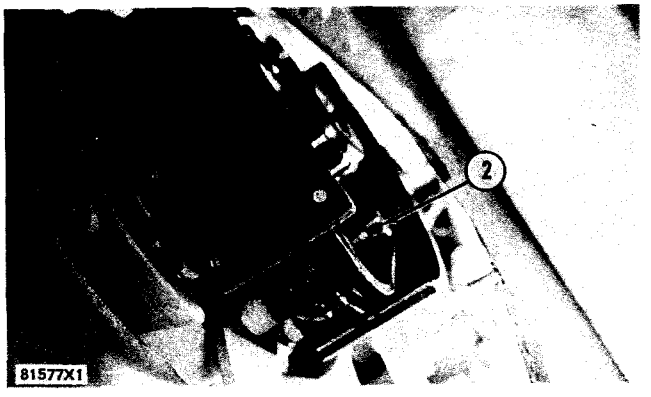
INSTALL PARKING BRAKE 12–4267

1. Put the brake shoe assembly (1) in position on the retainer.



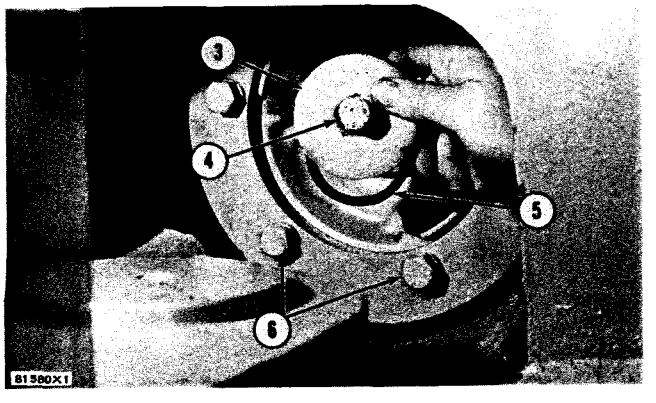
2. Put the brake lever in position between the brake shoe assembly and the retainer.

3. Install the four bolts (2) that hold the brake shoe assembly to the retainer.



4. Put the brake drum and flange in position on the transmission shaft and install the upper and lower bolts (6) that hold the brake drum to flange.

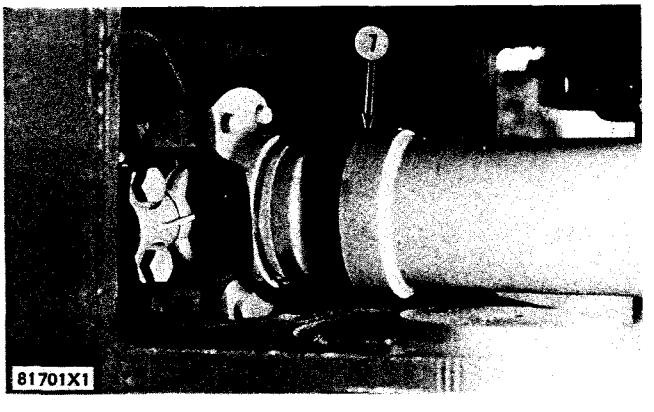
5. Install seal (5), retainer (3) and bolt (4) in the transmission shaft.



6. Install pin in parking brake rod.

7. Tighten nuts on parking brake rod.

8. Install drive shaft (7) and connect universal joints. Tighten bolts in universal joints to a torque of 98 ± 10 lb.ft. (13.6 ± 1.4 mkg).



9. Fill transmission to correct level.

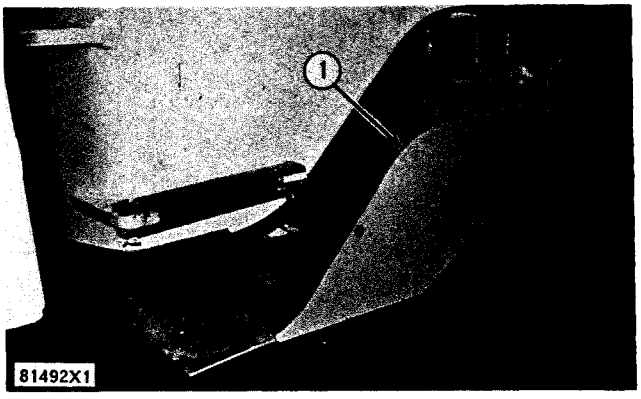
end by:

a) install transmission guard

FRONT DIFFERENTIAL

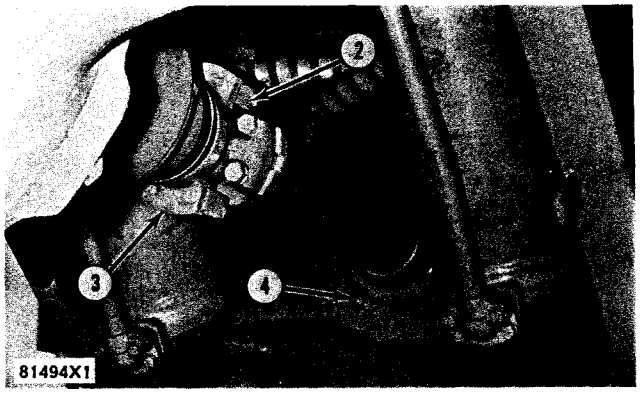
REMOVE FRONT DIFFERENTIAL 11–C–3258 OR 3263

1. Remove bottom plate (1). Weight is 250 lb. (113 kg).



2. Remove oil from axle housing.

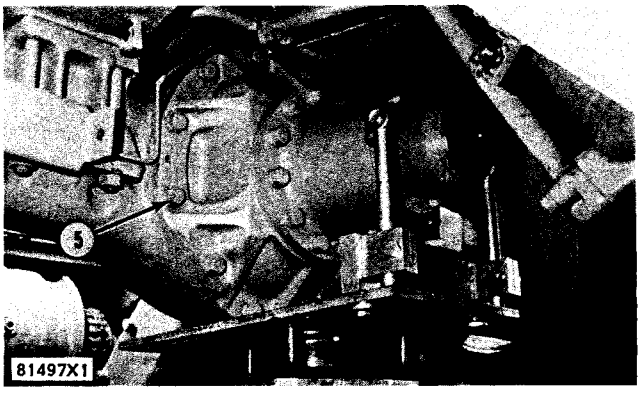
3. Remove wheel covers and pull drive axles out approximately 12 in. (30 cm).



4. Disconnect universal joint (2) from differential.

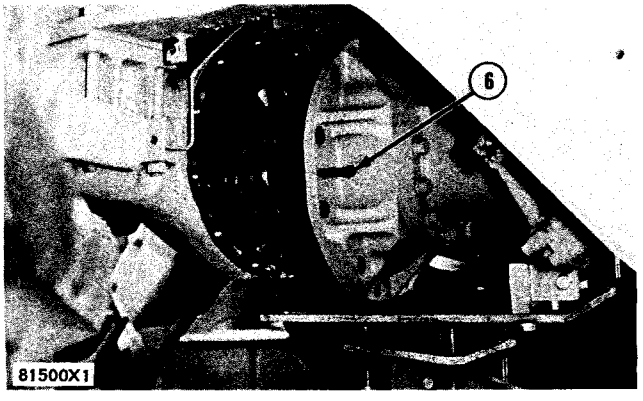
5. Remove the four bolts (4) from retainer. Push the drive shaft and retainer back and up. Fasten the drive shaft up and out of the way with a piece of wire or rope.

6. Remove the yoke (3) from the differential.



7. Put a transmission jack in position under differential and fasten it to the differential.

8. Remove the bolts (5) that hold differential to the axle housing.

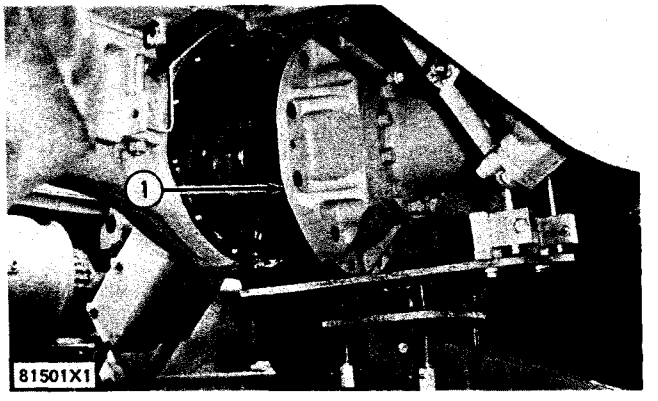


9. Install two 1/2"–13NC forcing screws (6) and remove the differential from axle housing. Weight of differential is 450 lb. (204 kg).

FRONT DIFFERENTIAL

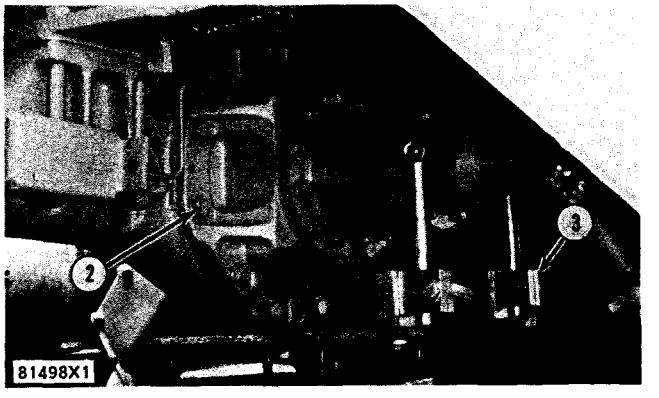
INSTALL FRONT DIFFERENTIAL 12–C–3258 OR 3263

1. Install the differential (1) on a transmission jack and put it in position under machine.



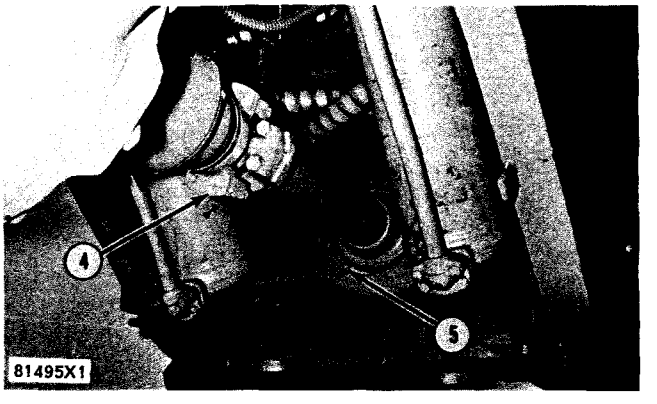
2. Push the differential into the axle housing and install bolts (2). Tighten the bolts to a torque of 195 ± 18 lb.ft. (26.9 ± 2.5 mkg).

3. Remove transmission jack (3) from differential.



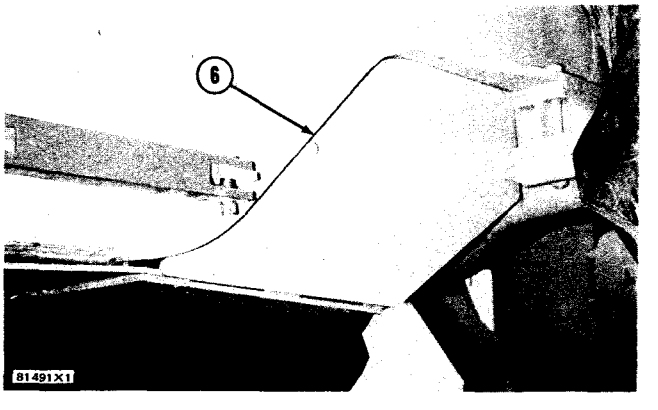
4. Install yoke (4) on differential.

5. Connect the universal joint to yoke (4) and tighten bolts to a torque of 98 ± 10 lb.ft. (13.6 ± 1.38 mkg).



6. Install bolts (5) in the retainer.

7. Install the bottom plate (6).



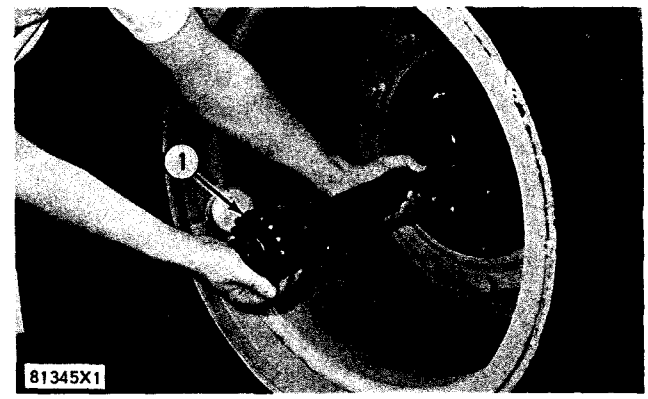
8. Fill the axle housing with oil to the correct level.

REAR DIFFERENTIAL

REMOVE REAR DIFFERENTIAL 11–D–3258 OR 3263

start by:
a) remove air tank guard
b) remove transmission bottom guard

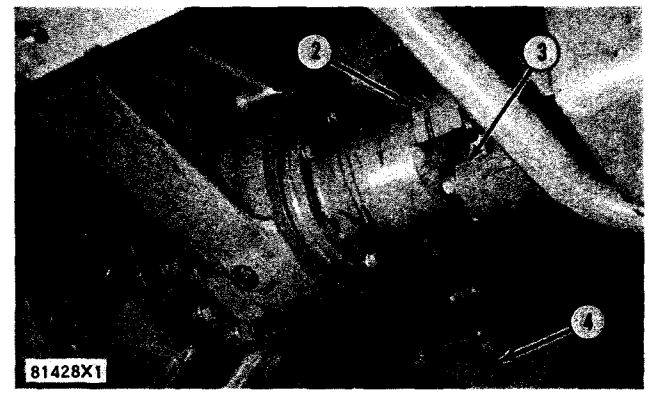
1. Remove oil from differential housing.



2. Remove final drive covers and pull drive axles (1) out approximately 12 in. (30 cm).

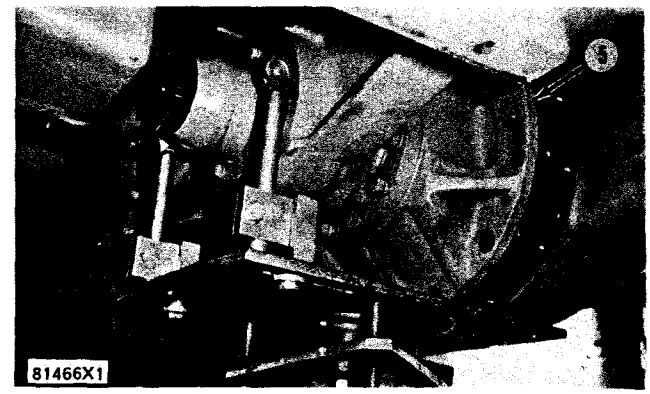
3. Remove universal joint (3).

4. Remove yoke (2) from differential.



5. Loosen bolts that hold rear support to the frame.

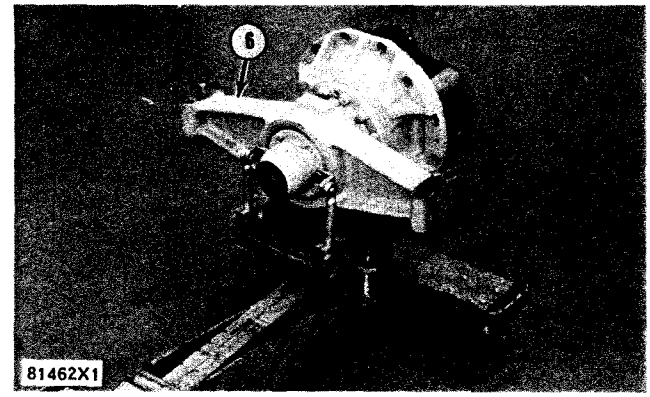
6. Remove bolts (4) that hold front support to frame.



7. Lift the rear frame with jacks until dowels in front support are out of frame.

8. Put a transmission jack in position under differential (5). Connect jack to differential.

9. Remove bolts that hold differential to axle housing.

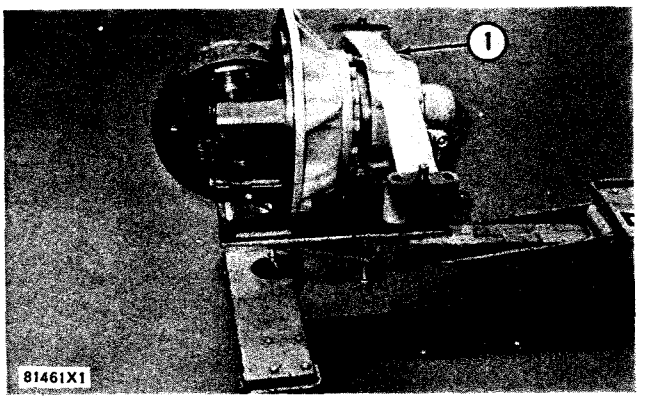


10. Remove differential and front support as a unit. Weight is 525 lb. (23 kg).

11. Remove differential and support from jack. Remove support (6) from differential. Weight is 88 lb. (40 kg).

REAR DIFFERENTIAL

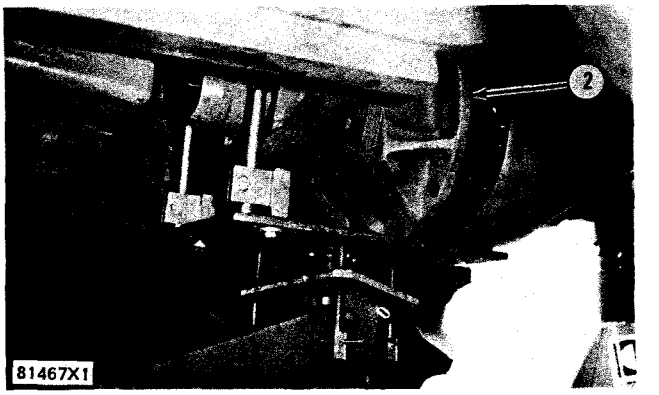
INSTALL REAR DIFFERENTIAL 12–D–3258 OR 3263



1. Install support (1) on differential.

2. Install support and differential on jack. Fasten jack to differential.

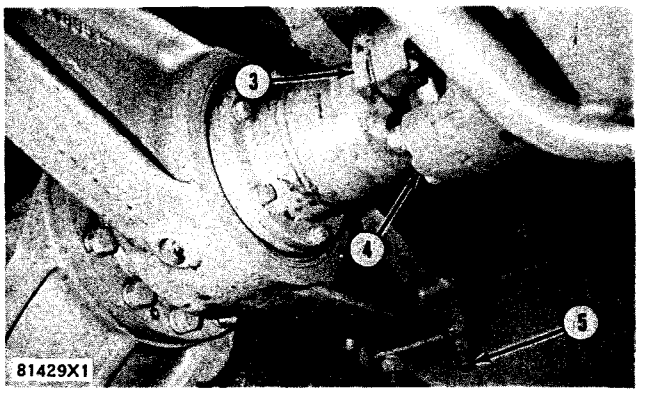
3. Put jack and differential in position under machine. Install differential (2) into axle housing.



4. Install bolts that hold differential to axle housing. Tighten bolts to a torque of 195 ± 18 lb.ft. (26.9 ± 2.5 mkg).

5. Remove the transmission jack.

6. Put the dowels in the front support in alignment with holes in frame. Lower the frame down on to the support.



7. Install the bolts (5) in front support. Tighten bolts in front and rear supports to a torque of 345 ± 30 lb.ft. (47.7 ± 4.1 mkg).

8. Install the yoke (3) and universal joint (4). Tighten universal joint bolts to 98 ± 10 lb.ft. (13.6 ± 1.38 mkg).

9. Install axles and final drive covers.

10. Fill the differential and final drives with oil to correct level.

end by:

a) install transmission bottom guard
b) install air tank guard

TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

DISASSEMBLE TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY 15--3263

Tools Needed		A	B	C
8B7548	Push Puller	1	1	1
8B7550	Leg	2		
8B7560	Step Plate	1	1	1
8B7551	Brg. Pulling Attachment	1		1
5H9976	Screw	1		
8H684	Ratchet Box Wrench	1	1	1
1P496	Plate	1		
8B7559	Adapter		2	
8B7549	Leg		2	2

start by:

a) remove torque proportioning differential and carrier assembly

1. Remove lockwire and locks from bearing caps.

2. Loosen adjusting nuts and remove retaining bolts (1).

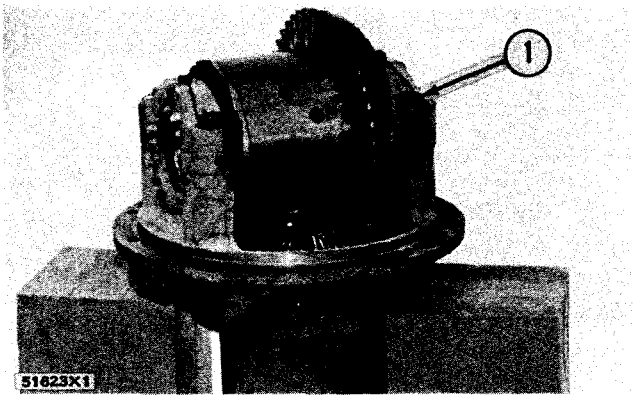
3. Put identification marks on bearing caps and nuts as to their respective location. Remove bearing caps (2), adjusting nuts (4), and bearing cups (3).

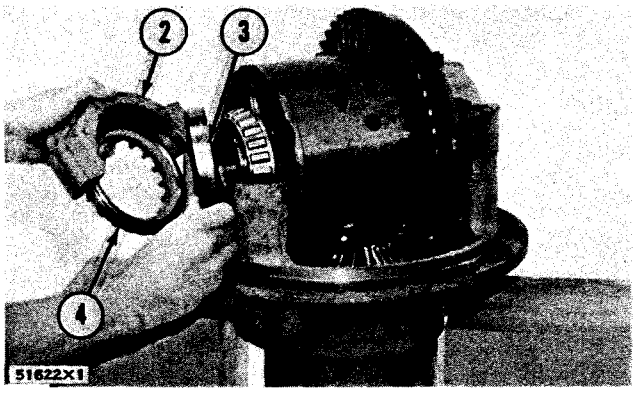
4. Remove differential (5) from carrier with a hoist. Weight is 175 lb. (79 kg).

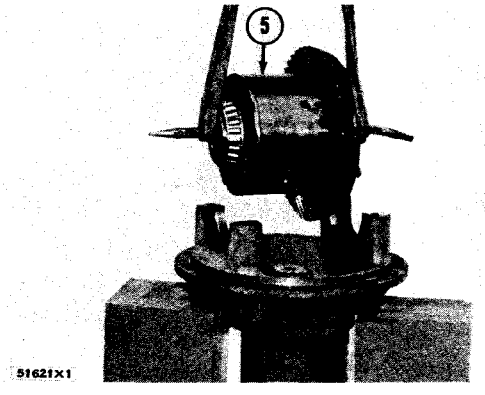
NOTE: Put a mark on the bevel gear and case for installation purpose.

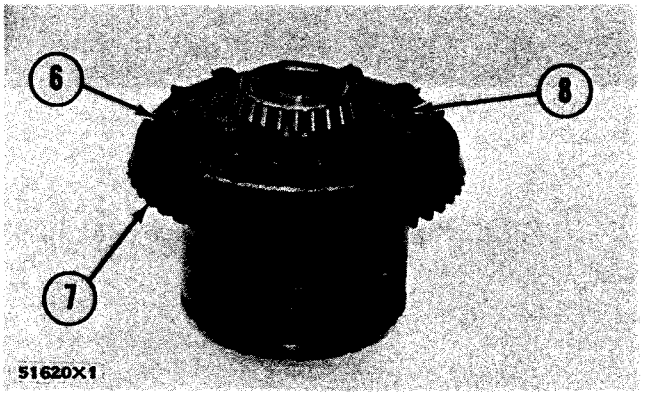
5. Remove locks and bolts (6). Remove the bevel gear (7) from the differential case.

6. Remove lockwire and bolts (8).



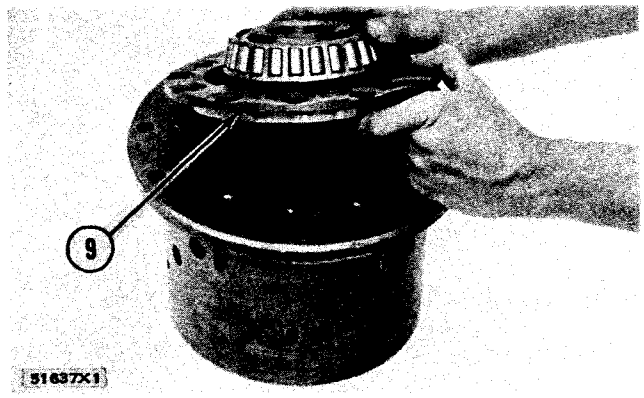




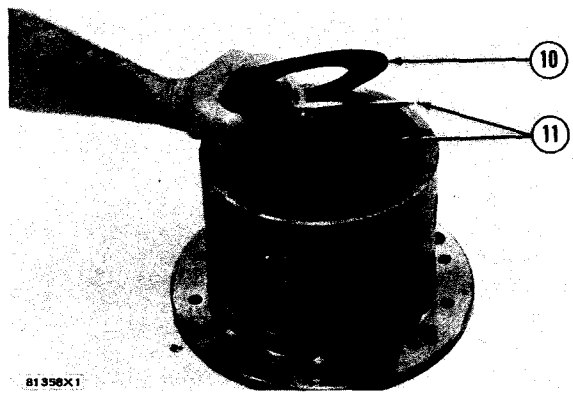


TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

7. Remove cover (9) from each end of differential case.



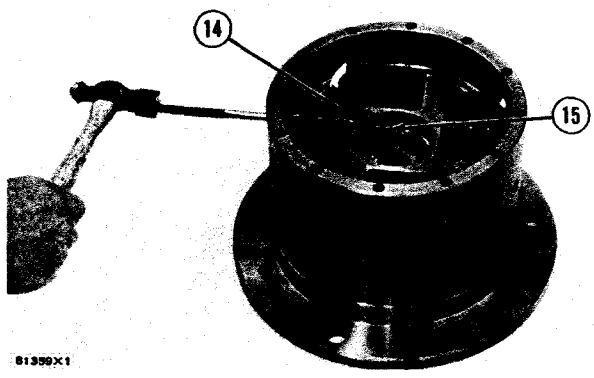
8. Remove disc (10) and two springs (11) from each end of differential case.



9. Remove gear (12) from each end of differential case.

10. Remove plug (13) from the case.

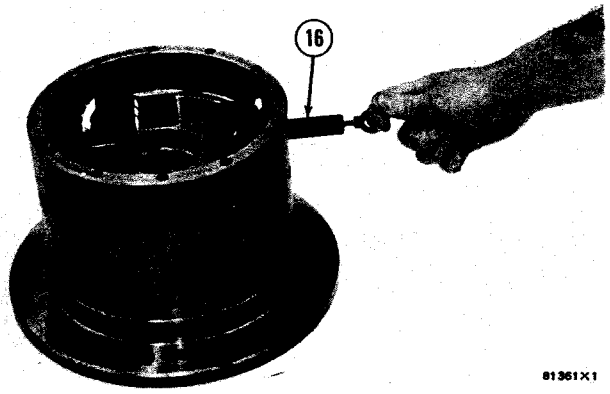
11. Use a hammer and a small diameter punch that will fit in the hole between pin (14) and the case. Remove the four pins (15) from the inside.



NOTE: Do not remove pins (14) from the case.

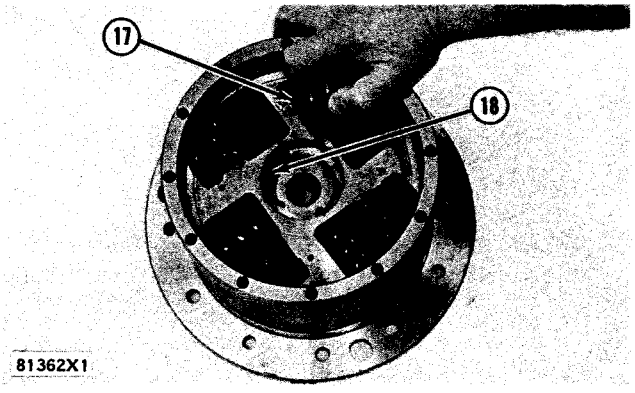
TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

12. Remove the four outer shafts (16) from the differential case with a 1/4"–20NC forged eyebolt. Put identification on the shafts to keep them separate from the inner shafts.



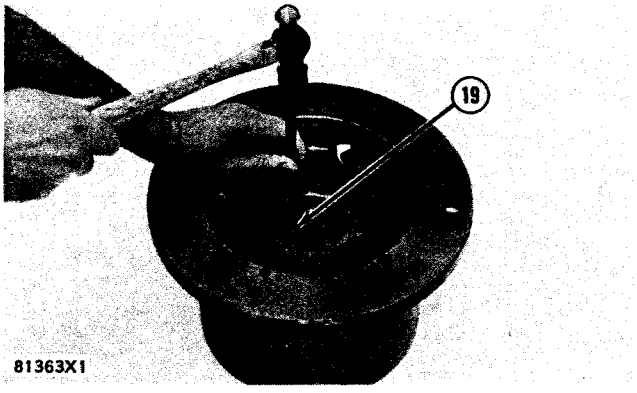
13. Remove four outer pinion gears (17) and put identification on the gears to keep them separate from the inner gears.

14. Remove the ring (18) from the case.



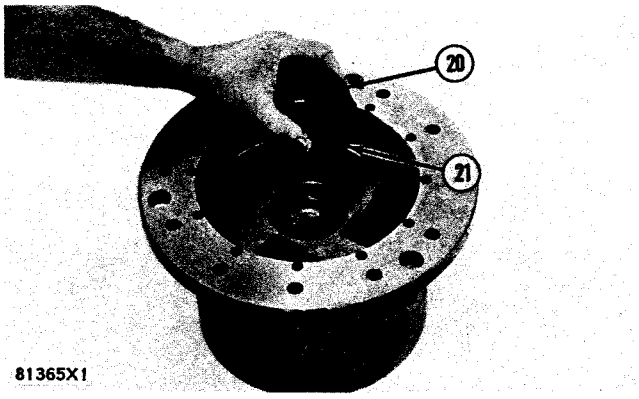
15. Turn the differential case on the opposite end and do Steps 9 through 12 again.

16. Remove four pins (19) with a hammer and punch.



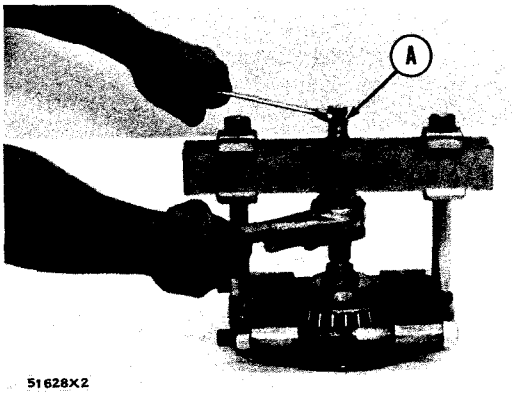
17. Remove the four inner shafts from the differential case with a 1/4"–20NC forged eyebolt. Put identification on the shafts to keep them separate from the outer shafts.

18. Remove the four inner pinion gears (21) and eight plates (20). Put identification on the gears to keep them separate from the outer gears.



TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

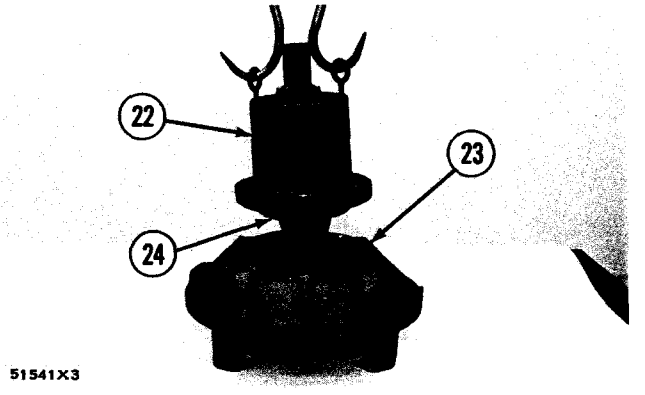
19. Remove bearing cones from the end covers of the differential case with tooling (A).



20. Turn carrier on opposite end. Remove seal retainer from end of pinion housing. Remove seal from retainer.

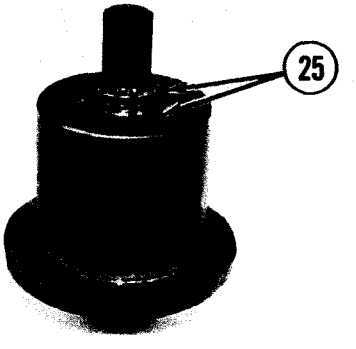
21. Install two 3/8"–16NC forged eyebolts in the pinion housing. Remove bolts that hold pinion housing to the carrier.

22. Install two 1/2"–13NC, 2 in. long bolts as forcing screws. Remove the pinion housing (22) and shims (23) from the carrier.



23. Remove O-ring seal (24) from pinion housing.

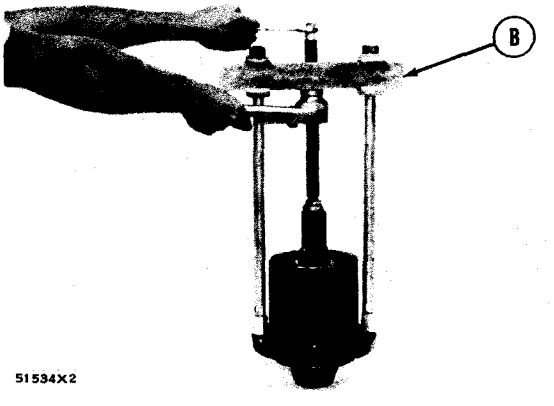
24. Remove nuts (25) and lock from pinion shaft.



25. Install tooling (B) and remove housing and bearing cone from pinion shaft.

26. Remove bearing cups from pinion housing with a punch and hammer.

27. Remove bearing cone from pinion shaft with tooling (C).



TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

ASSEMBLE TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY 16–3263

Tools Needed		A	B	C
8B7554	Puller	1		
8B7552	Bolt	1		
9S7354	Torque Wrench	1		
8S2328	Dial Test Indicator Group			1
1P492	Drive Plate		1	
1P531	Handle		1	

1. Put all bearing cones in oil at a maximum temperature of 275°F (135°C).

2. Install bearing cups in pinion housing (1).

3. Install large bearing cone (3) on pinion shaft (2).

4. Put housing (1) in position on pinion shaft (2).

5. Install small bearing cone (4) on pinion shaft (2).

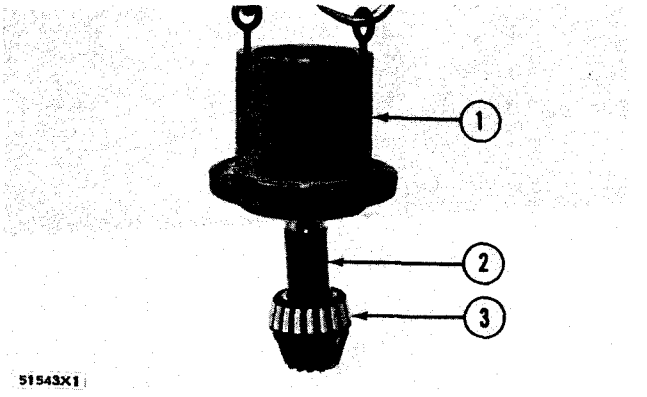
6. Install nuts (5) and (6) and lock (7) but do not tighten the nuts.

7. Let the bearing cones become cool. Install tooling (A) and use the torque wrench (8) to check the preload of the pinion bearing cones.

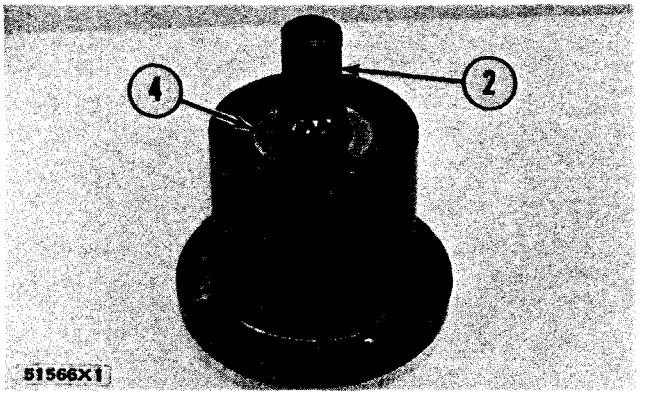
8. Tighten nut (6) until a torque of 6 to 10 lb.in. (6.9 to 11.5 cm.kg) is needed to constantly turn the pinion shaft.

9. Tighten nut (5) and make a bend in the lock (7). Check the torque needed to turn the pinion shaft again.

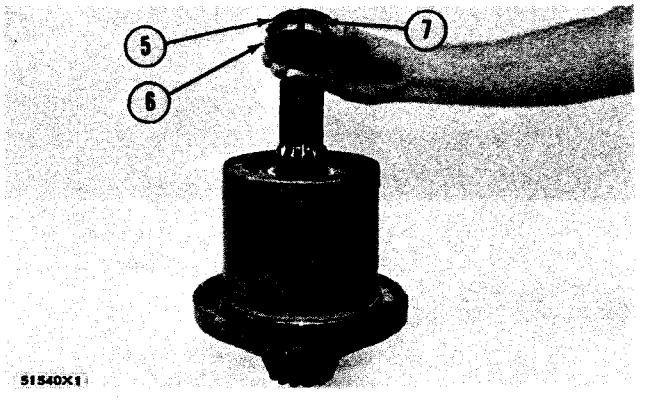
10. Install new O-ring seal in the groove on flange end of the pinion housing.



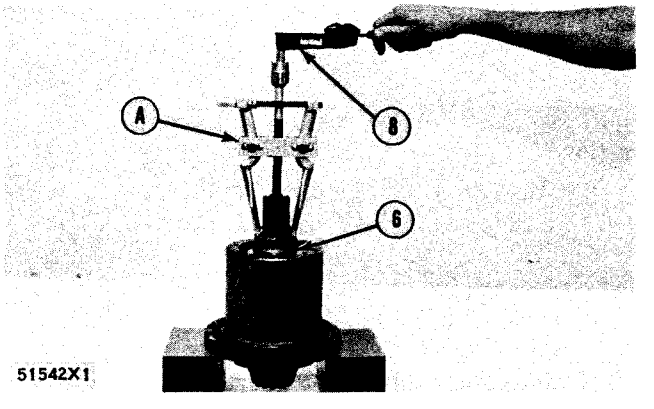
51543X1



51566X1



51540X1

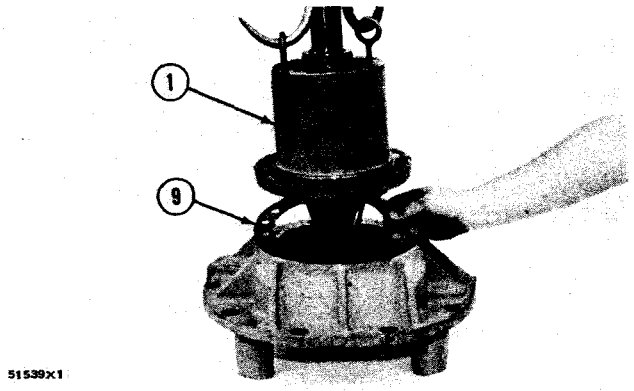


51542X1

TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

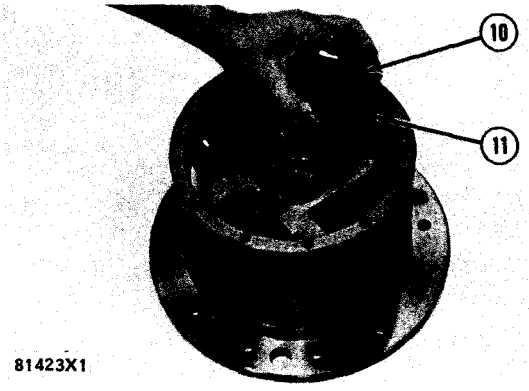
11. Put original shims (9) and pinion housing (1) in position on the carrier and install the bolts.

NOTE: If the original shims are not available, add enough shims to put heel of ring gear in alignment with pinion when the ring gear is installed.



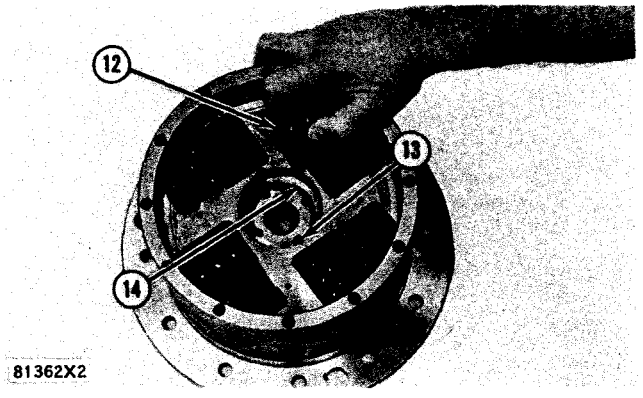
12. Install bearing cones on the end covers of the differential case.

13. Put the inner pinion gears (11) and plates (10) into position in the differential case and install the inner shafts.



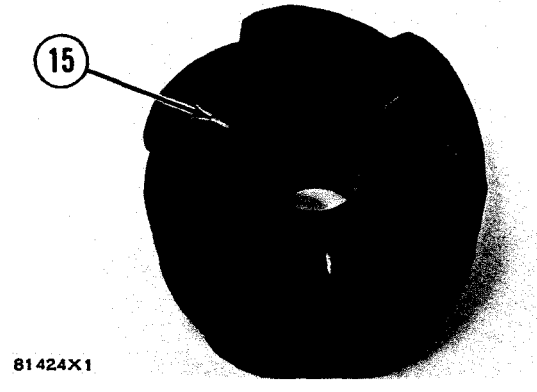
14. Put the holes in the shafts in alignment with the holes in the case and install four pins (13) until they are even with the case.

15. Install ring (14) in case.



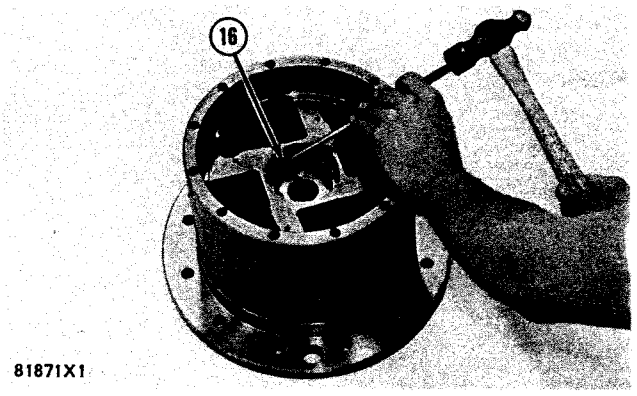
16. Put the outer pinion gears (12) into position in the differential case with the marks (15) on gears toward the inside. Put the plates in alignment and install the outer shafts.

NOTE: The flat part on the end of the outer shaft must be in alignment with the radius of the case.



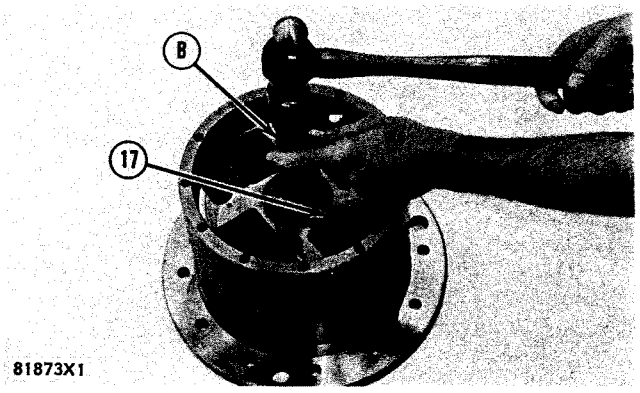
TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

17. Put the holes in the outer shafts in alignment with the holes in the case. Install pins (16) even with the bore in case.



18. Install a plug (17) in each side of the case with tooling (B).

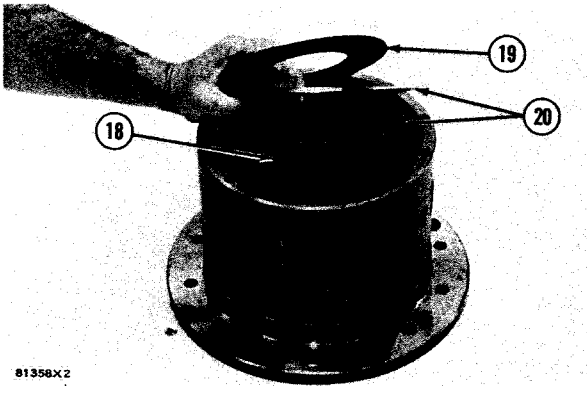
19. Install gear (18) in each end of differential case.



20. Install two springs (20) and disc (19) in each end of the differential case. Springs (20) must be installed so outer edge makes contact first with gear (18).

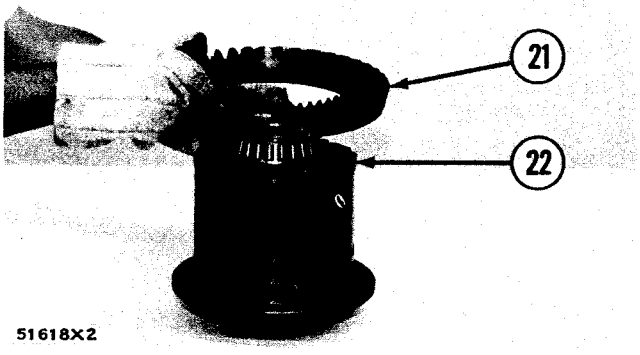
21. Install cover (22) on each end of the differential case with the dowels in covers in alignment with holes in disc. Install bolts in covers.

22. Install lockwire through the bolts in the covers.



23. Check to make sure flange of case and contact surface of bevel gear are clean and free of burrs.

24. Heat the bevel gear to a maximum temperature of 250°F (120°C). Install the bevel gear (21) on differential case in the same position from which it was removed.



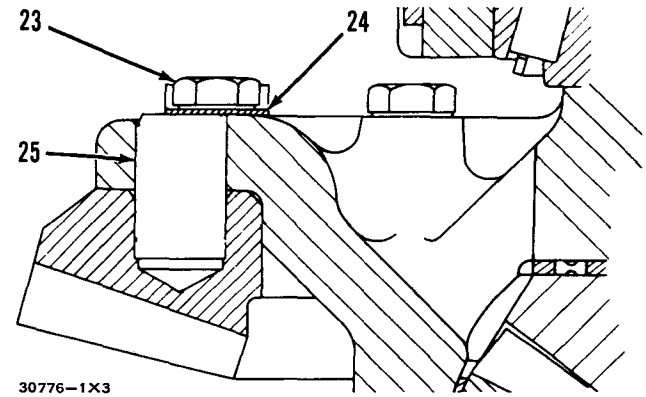
TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

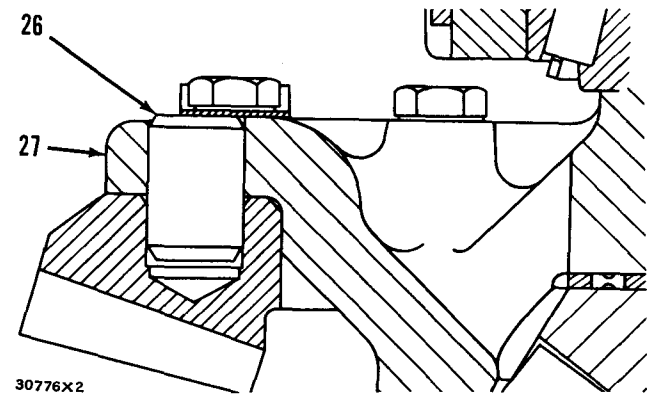
25. Put oil on the threads of bolts (23) and on face of washers (24) that hold gear to case. Install the bolts, washers, and locks. Tighten all bolts the same amount until they have a torque of 98 ± 9 lb.ft. (13.6 ± 1.2 mkg). Make a bend in the locks.

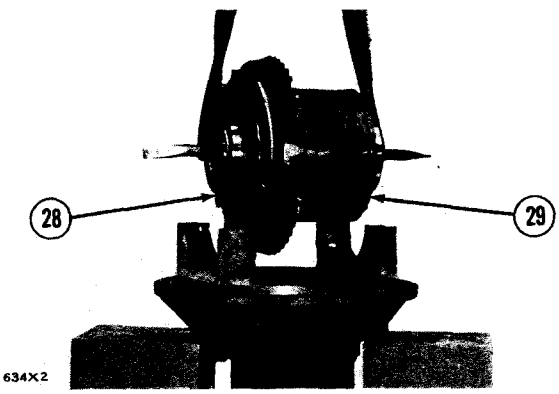
26. If original bevel gear and case are being used again, the dowels must fit tight in both the gear and the case. If the dowels do not fit tight, remove them. Install the larger service dowels using procedure in Step 27.

27. If a new bevel gear and/or case are being installed, install the larger service dowels using following procedure:
    a) Make the original dowel holes (25) larger by using a .844 in. (21.4 mm) drill or a .875 in. (22.2 mm) core drill.
    b) Again, make the dowel holes larger by line reaming them to a diameter of .9045 to .9055 in. (22.9743 to 22.9997 mm). Use a standard .906 in. (23.1 mm) reamer to do this.
    c) Install the three service dowels (26) even with face of differential case (27).
28. Put differential (29) and bearing cups (28) in carrier with a hoist.

NOTE: Install the differential and bevel gear in the carrier with the bevel gear nearest the bearing cap that is on the same side of the carrier as the flat place on the outside diameter of carrier flange.

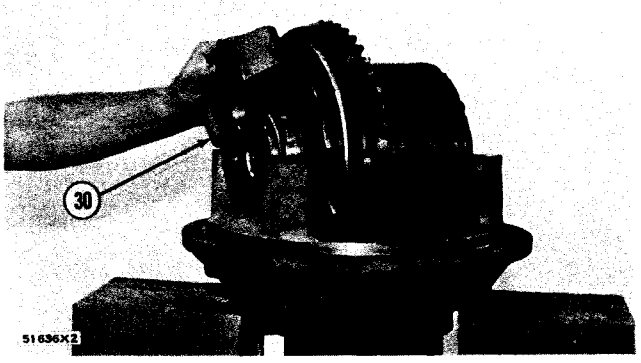




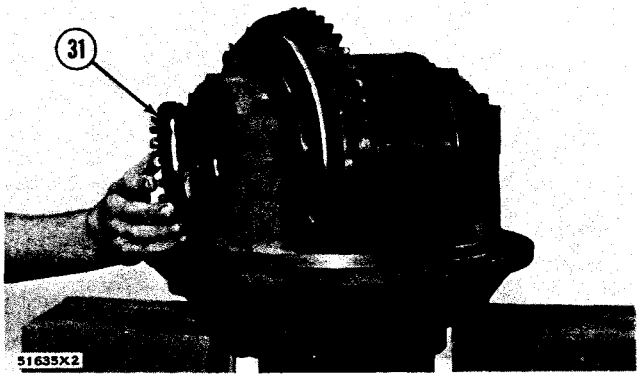


TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

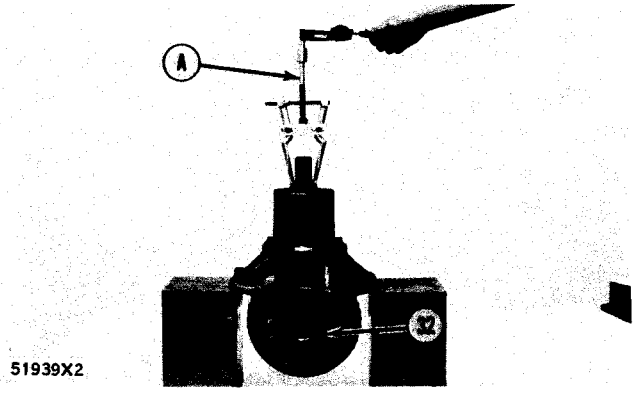
29. Install bearing caps (30) in their respective positions and install bolts.



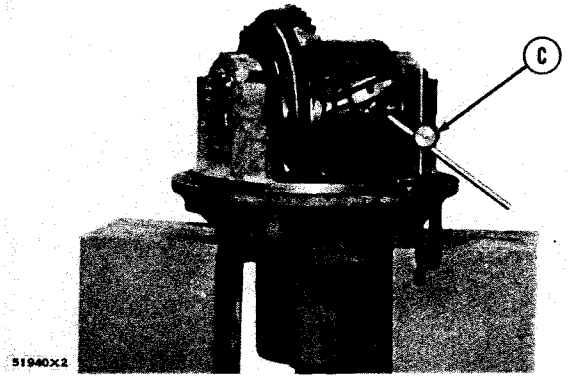
30. Install adjusting nuts (31) to give approximately .007 to .014 in. (0.17 to 0.35 mm) gear clearance (backlash) between the pinion and ring gear.



31. Install tool (A) and check the bearing preload. Turn adjusting nuts (32) until a torque of 30 to 50 lb.in. (34.5 to 57.5 cm.kg) is needed to constantly turn the pinion shaft.



32. Check the gear clearance (backlash) with tool (C). If gear clearance (backlash) is not between .007 to .014 in. (0.17 to .035 mm), turn the two adjusting nuts (26) the same amount but in opposite directions to get the correct gear clearance (backlash) setting.

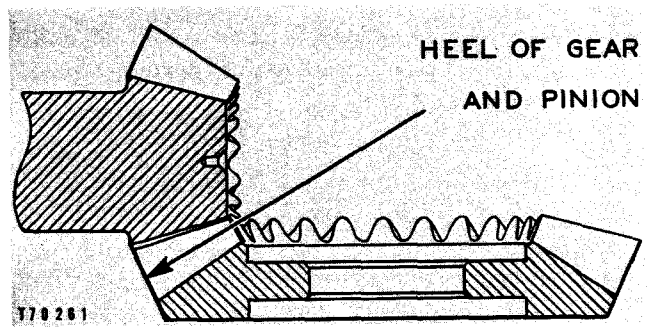


TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

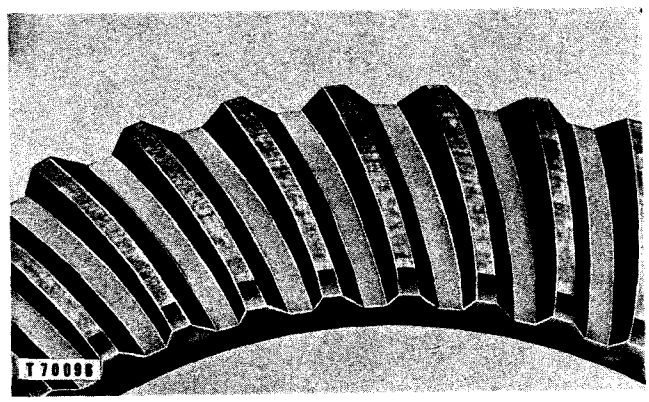
33. After gear clearance (backlash) and bearing preload adjustment have been made, check tooth contact setting between bevel gear and pinion using following procedure:
    a) Put small amount of prussian blue, red lead, or paint on bevel gear teeth. Turn pinion and check marks made on bevel gear teeth.
    b) With no load, correct tooth contact setting will be as shown. The area of contact starts near toe of gear and goes about 30% up the length of tooth. With this setting, when load is put on gear, it will be over the correct area of teeth.
    c) If bevel pinion shaft is too far away from bevel gear, short toe contact will result as shown. The teeth of pinion will be in contact with toe ends of convex faces (part that makes a curve toward the outside), and top edge of heel end of concave faces (part that makes a curve toward the inside). To correct this, move pinion shaft toward gear by decreasing shim thickness between pinion cage and carrier. After doing this, check gear clearance (backlash) and tooth contact again.
    d) If bevel pinion shaft is too near to center of bevel gear, short heel contact will result as shown. The teeth of pinion will be in contact with toe ends of concave faces (part that makes a curve toward the inside) and the heel ends of convex faces (part that makes a curve toward the outside). To correct this, move pinion shaft away from gear by increasing shim thickness between pinion cage and carrier. After doing this, check gear clearance (backlash) and tooth contact again.

NOTE: Several adjustments of both pinion and bevel gear can be needed before correct tooth contact setting and gear clearance (backlash) is made. Always remember that a change to gear clearance (backlash) will also change the tooth contact setting. Therefore, be sure gear clearance (backlash) is in correct adjustment before checking tooth contact.

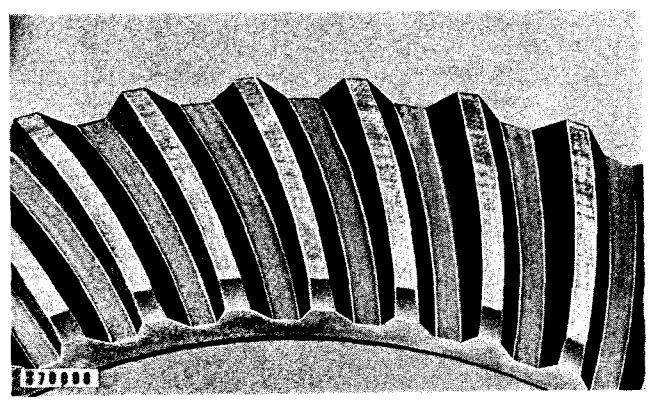
    e) After correct gear clearance (backlash) and tooth contact setting is made, remove extra prussian blue, red lead, or paint from bevel gear and pinion.



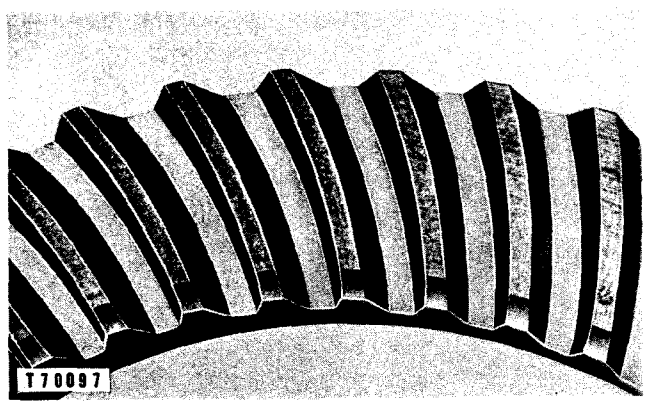
ALIGNING BEVEL GEAR AND PINION



CORRECT TOOTH CONTACT SETTING



SHORT TOE CONTACT SETTING

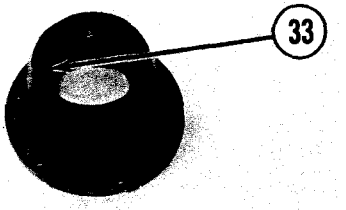


SHORT HEEL CONTACT SETTING

TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY

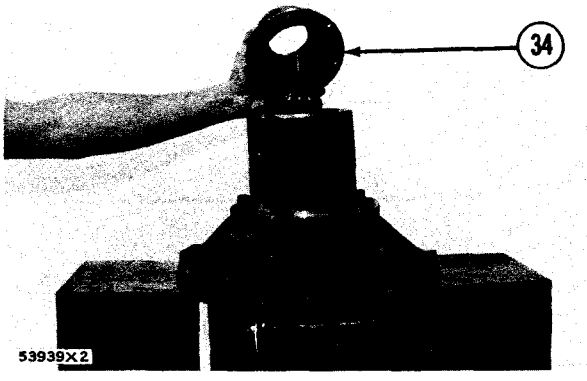
34. Install lock on adjusting nuts and check the preload again by using turning torque method.

35. Install the lockwire through bolts in the bearing caps.



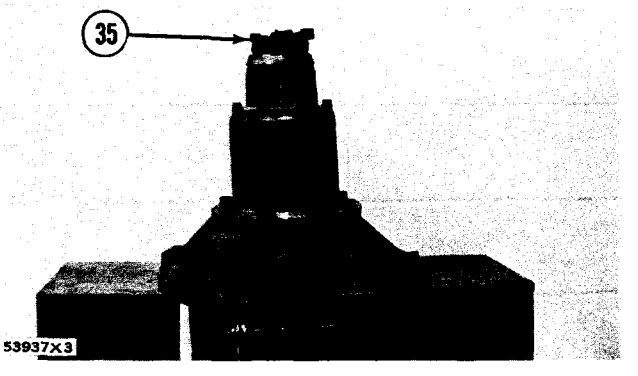
53938X3

36. Install seal (33) in retainer.



53939X2

37. Put retainer (34) over pinion shaft and install bolts that hold it to the housing.



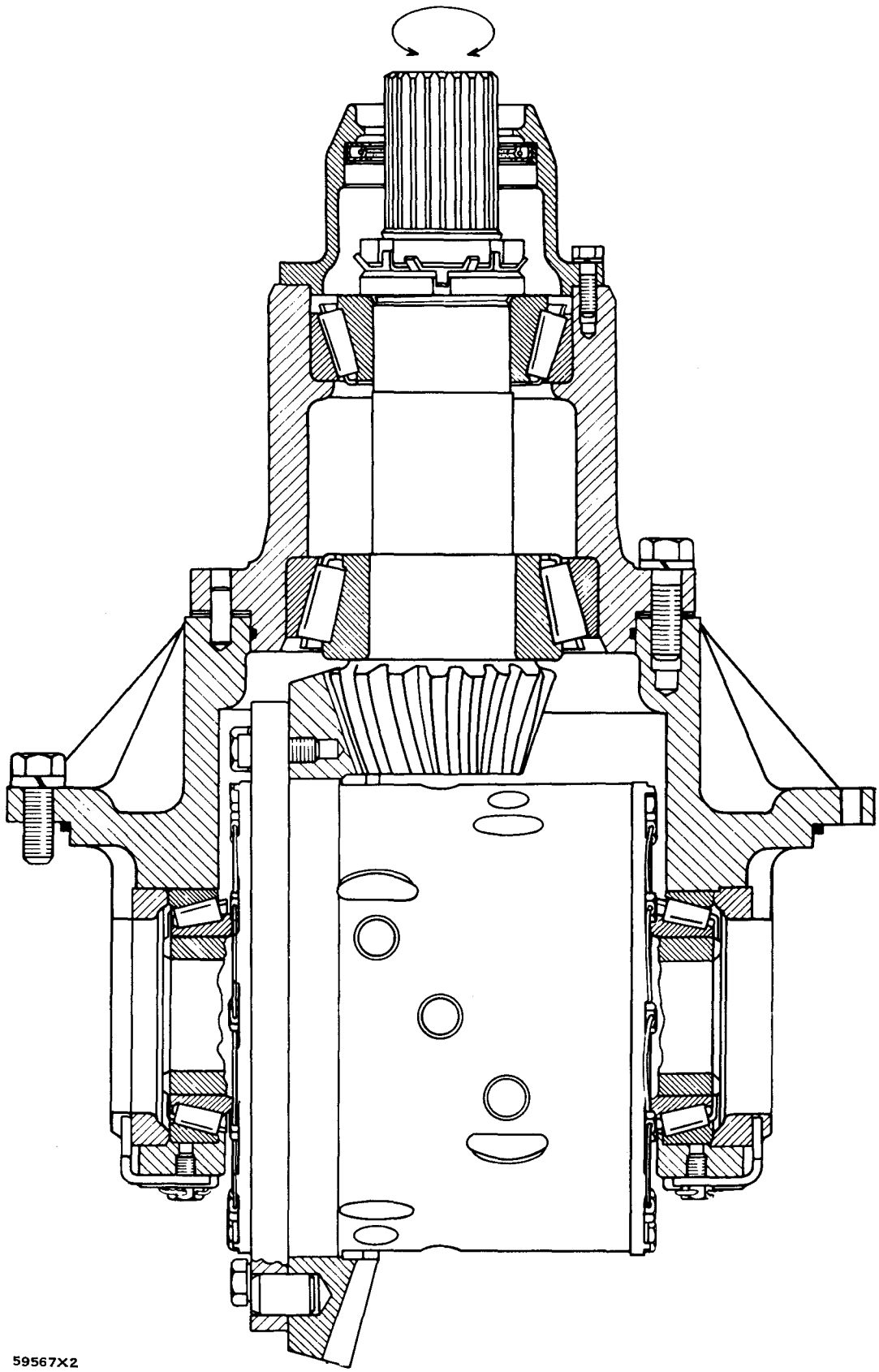
53937X3

38. Install yoke (35).

end by:

a) install torque proportioning differential and carrier assembly

TORQUE PROPORTIONING DIFFERENTIAL AND CARRIER ASSEMBLY



59567X2

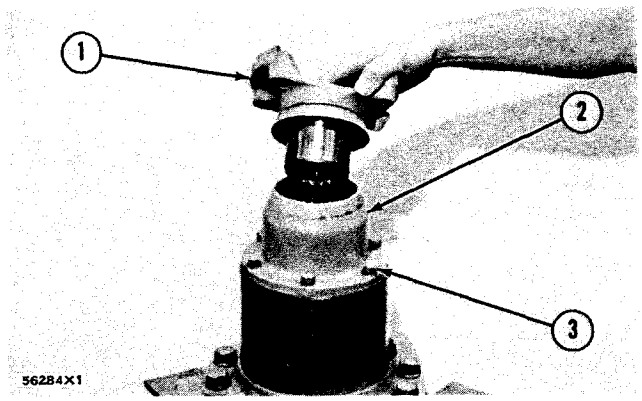
DIFFERENTIAL AND CARRIER ASSEMBLY

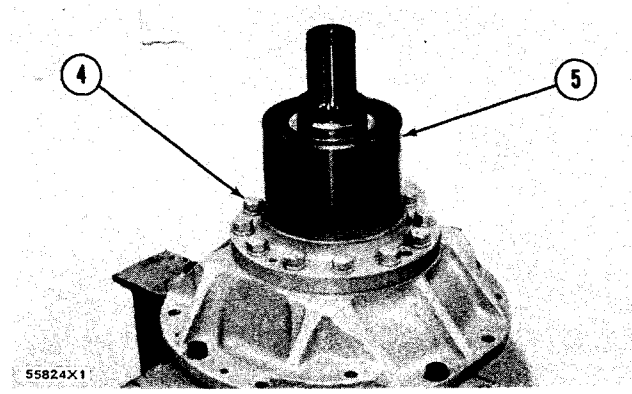
DISASSEMBLE DIFFERENTIAL AND CARRIER ASSEMBLY 15–3258

Tools Needed		A	B	C	D
1P2420	Transmission Repair Stand	1			
FT957	Differential Repair Positioning Group	1			
1P820	Hydraulic Puller Group		1		1
8B7557	Adapter		2		
8B7549	Leg		2		
1B4207	Nut		2		2
8B7560	Step Plate		1		
3H465	Plate		4		4
5F7343	Bearing Pulling Attachment			1	
1H3107	Push Puller			1	
1H3108	Leg			2	
7F9540	Hydraulic Puller			1	
8B7551	Bearing Pulling Attachment				1
1P490	Drive Plate				1
5F7369	Leg				2

start by:

a) remove differential and carrier assembly





1. Put the differential and carrier assembly on stand (A) with bevel gear down.

2. Remove the yoke (1).

3. Remove the bolts (3) and seal retainer (2). Remove the seal from retainer (2).

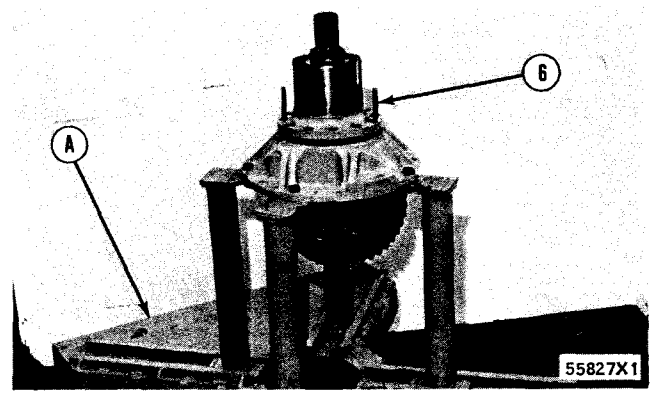
4. Remove the bolts (4) that hold cage (5) for bevel pinion to the carrier.

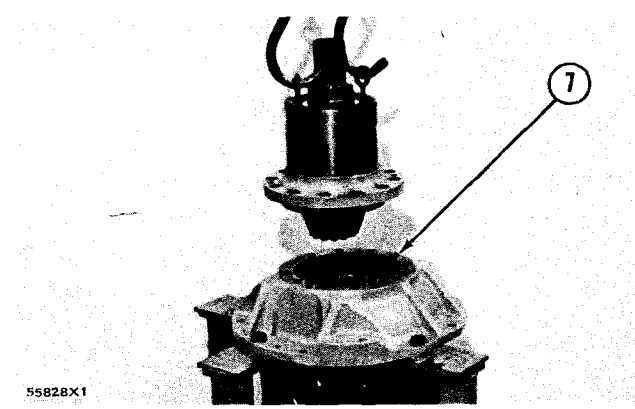
5. Install two 1/2"–13NC forcing screws (6), and loosen the cage (5) from carrier.

6. Remove the forcing screws, and install two 3/8"–16NC forged eyebolts.

7. Connect a hoist and remove the bevel pinion shaft and cage assembly. Weight of assembly is 85 lb. (39 kg).

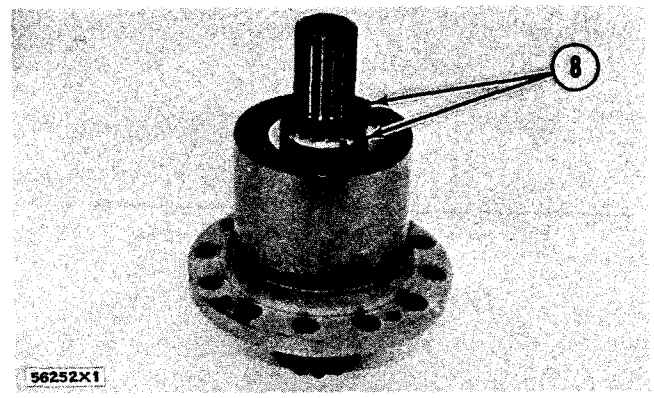
8. Remove and put identification on shims (7) for use during assembly of differential and carrier assembly.



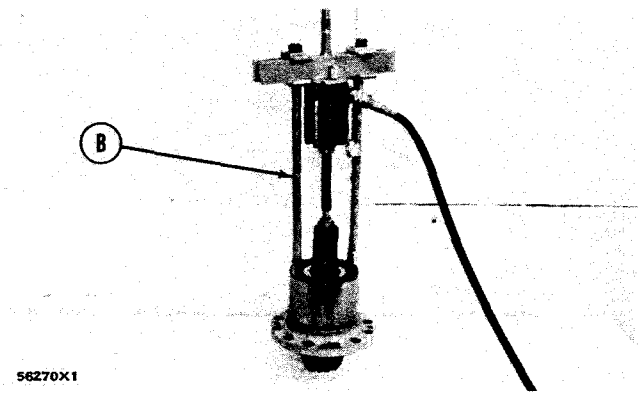


DIFFERENTIAL AND CARRIER ASSEMBLY

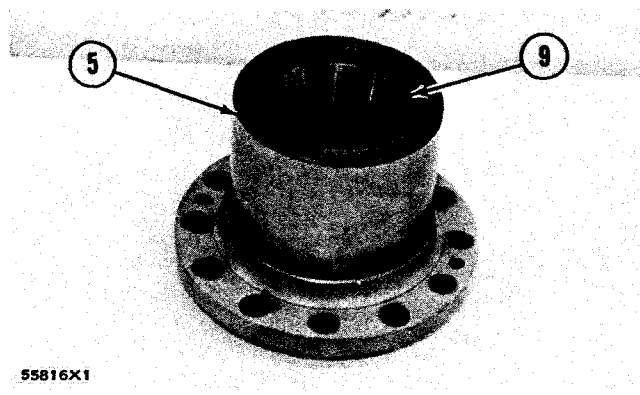
9. Disassemble the bevel pinion shaft and cage assembly as follows:



a) Remove the two spanner nuts (8) and lock.

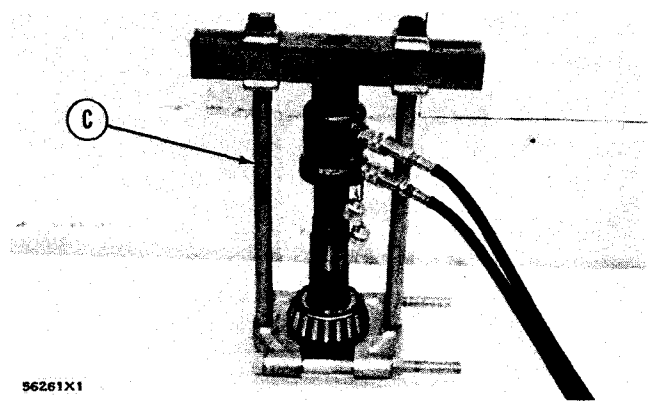


b) Install tooling (B), and remove the pinion shaft from cage.



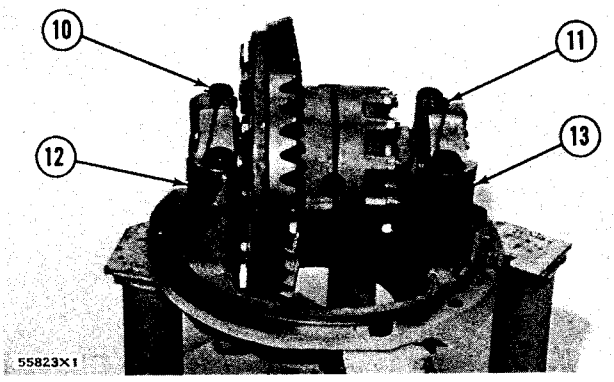
c) Remove the small bearing cone from cage (5). Remove bearing cups (9) from cage.

d) Install tooling (C), and remove the large bearing cone from bevel pinion shaft.



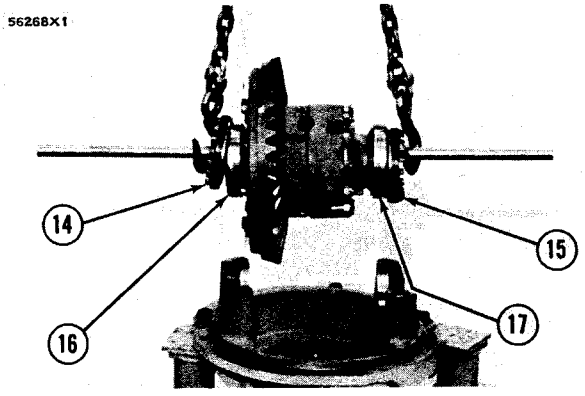
DIFFERENTIAL AND CARRIER ASSEMBLY

10. Connect a hoist and turn differential and carrier assembly over on stand (A) with bevel gear up.



11. Remove the lockwire from bolts (11). Remove the bolts (11) and two locks.

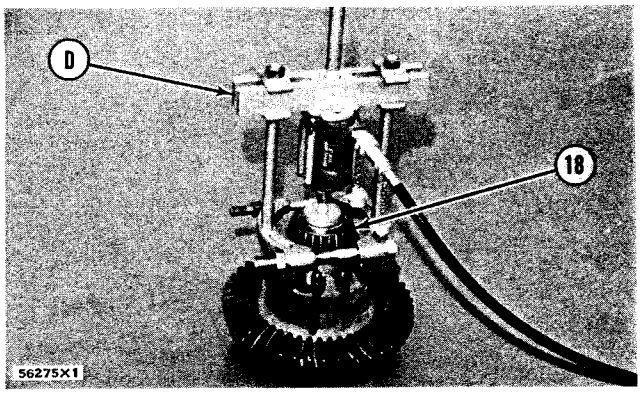
12. Put identification marks on bearing caps (12) and (13) to make sure caps are installed back in their correct positions.



13. Remove the bolts (10) from bearing caps (12) and (13). Remove the bearing caps.

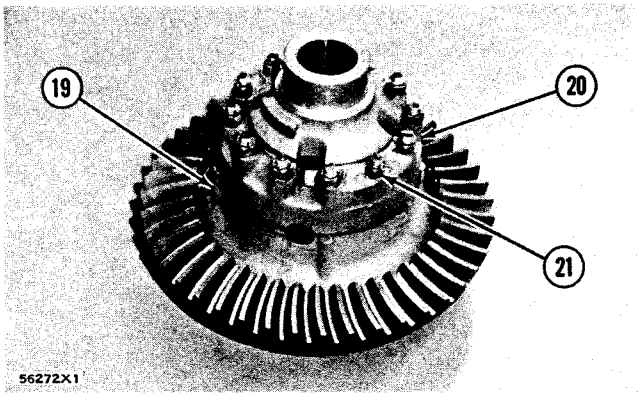
14. Put a bar through the differential. Connect a hoist and remove the differential assembly. Weight of assembly is 135 lb. (61 kg).

15. Remove adjusting rings (14) and (15).



16. Put identification marks on bearing cups (16) and (17) to make sure cups are installed with their respective bearing cones. Remove the bearing cups (16) and (17).

17. Install tooling (D) and remove bearing cone (18) from differential.

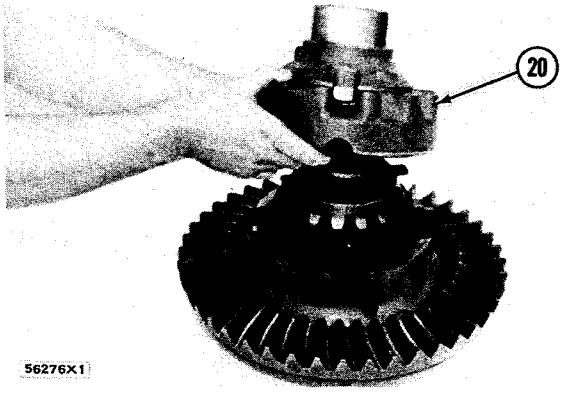


18. Put an alignment mark on cases (19) and (20) in the same place to make sure of correct alignment during assembly.

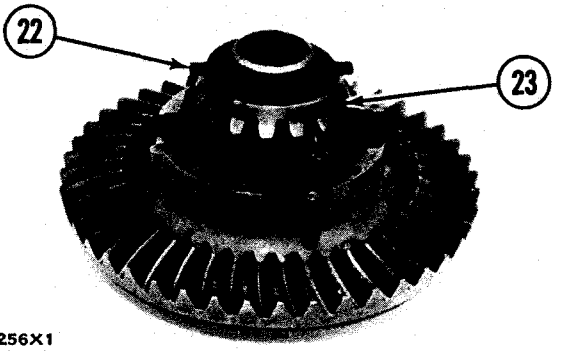
19. Remove cotter pins from nuts (21). Remove the nuts (21) and bolts.

DIFFERENTIAL AND CARRIER ASSEMBLY

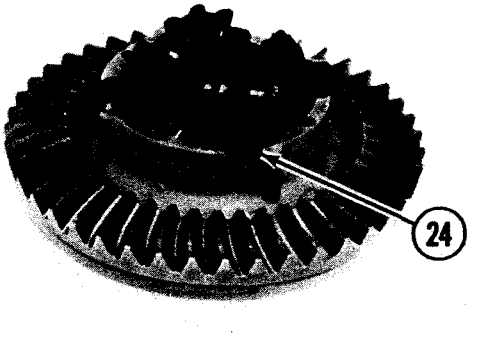
20. Remove differential case (20).



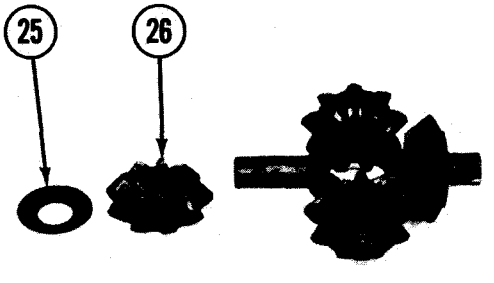
21. Remove thrust washer (22) and side gear (23).



22. Remove the pinions and spider (24) as a unit.

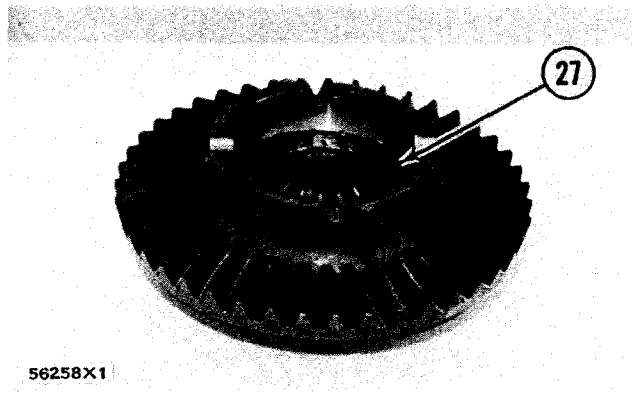


23. Remove the thrust washers (25) and pinions (26) from spider (24).

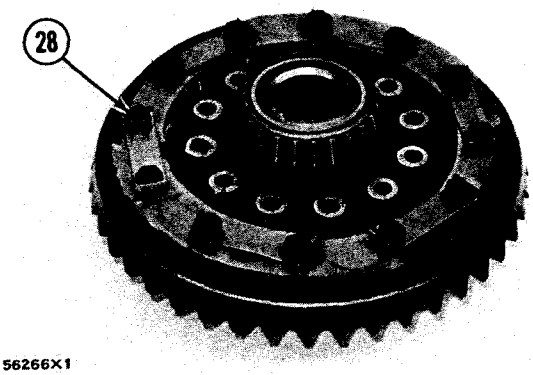


DIFFERENTIAL AND CARRIER ASSEMBLY

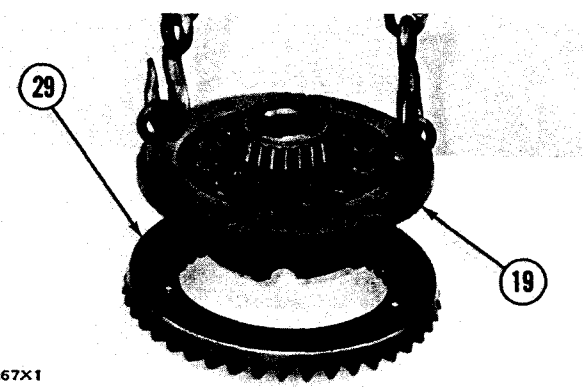
24. Remove the side gear (27) and thrust washer from differential case.



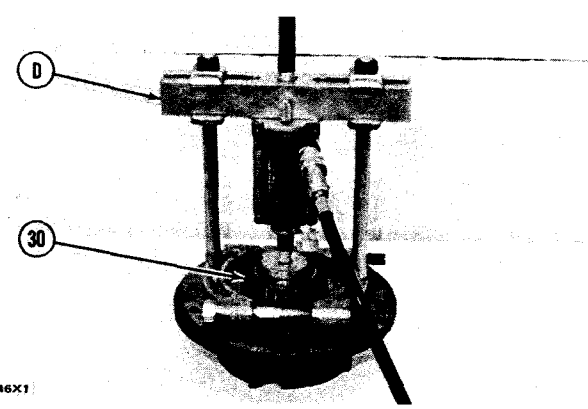
25. Remove the bolts (28), washers, and locks that hold bevel gear to differential case.



26. Remove bevel gear (29) from case (19).

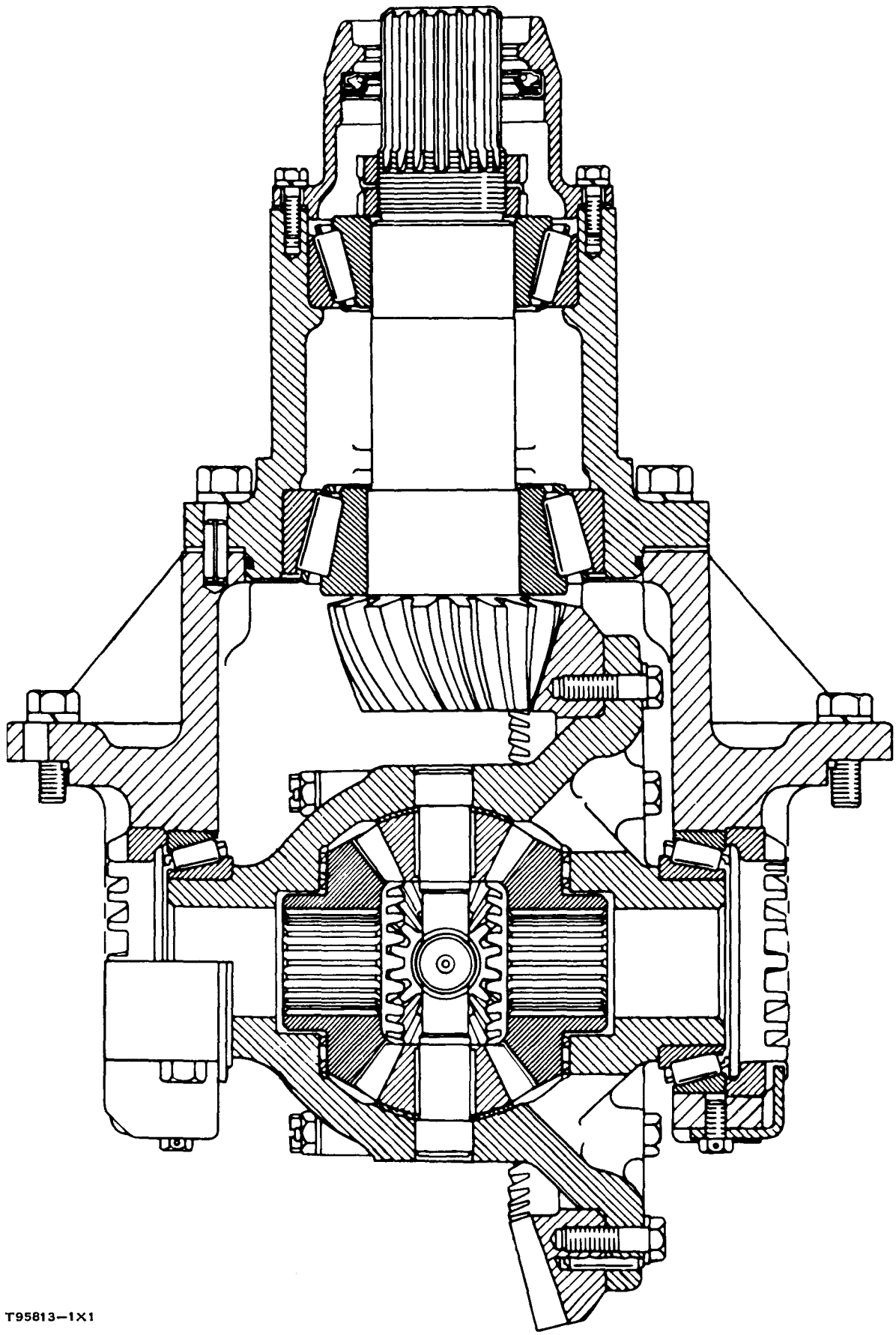


27. Remove the differential case (19).



28. Install tooling (D) and remove the bearing cone (30) from case.

DIFFERENTIAL AND CARRIER ASSEMBLY



T95813—1X1

DIFFERENTIAL AND CARRIER ASSEMBLY

ASSEMBLE DIFFERENTIAL AND CARRIER ASSEMBLY 16–3258

Tools Needed		A	B	C	D
1P2420	Transmission Repair Stand	1			
FT957	Differential Repair Positioning Group	1			
1P512	Drive Plate		1		
1P532	Handle		1		
6J4081	Bolt (1"–18NC x 13 in.)			1	
1B4333	Nut			1	
8S2328	Dial Test Indicator Group				1

1. Check to make sure flange of case and contacting surface of gear are clean and free of burrs.

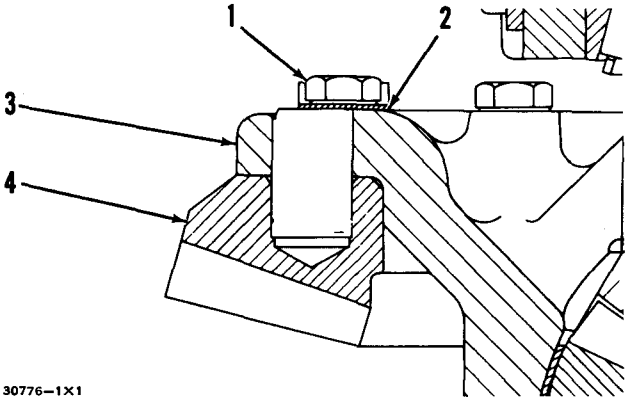
2. Heat the bevel gear to a maximum temperature of 250° F (120° C). Install the bevel gear (4) on differential case (3).

3. Put oil on the threads of bolts (1) and on face of washers (2) that hold gear to case. Install the bolts, washers, and locks. Tighten all bolts the same amount until they have a torque of 98 ± 9 lb.ft. (13.6 ± 1.2 mkg). Make a bend in the locks.

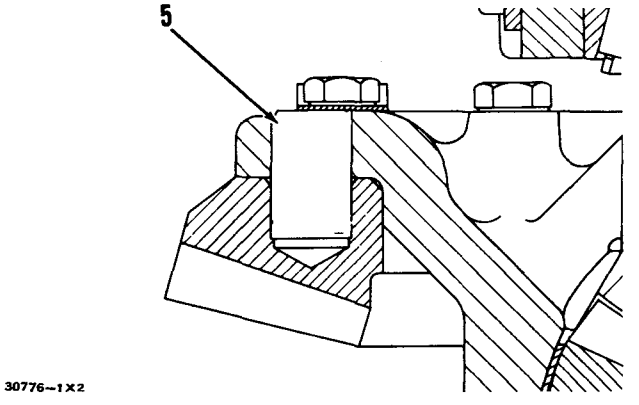
4. If original bevel gear and cases are being used again, the dowels must fit tight in both the gear and the case. If the dowels do not fit tight, remove them. Install the larger service dowels using procedure in Step 5.

5. If a new bevel gear and/or cases are being installed, install the larger service dowels using following procedure:
   a) Make the original dowel holes (5) larger by using a .844 in. (21.4 mm) drill or a .875 in. (22.2 mm) core drill.
   b) Again, make the dowel holes larger by line reaming them to a diameter of .9045 to .9055 in. (22.9743 to 22.9997 mm). Use a standard .906 in. (23.1 mm) reamer to do this.
   c) Install the three service dowels (6) even with face of differential case (3).

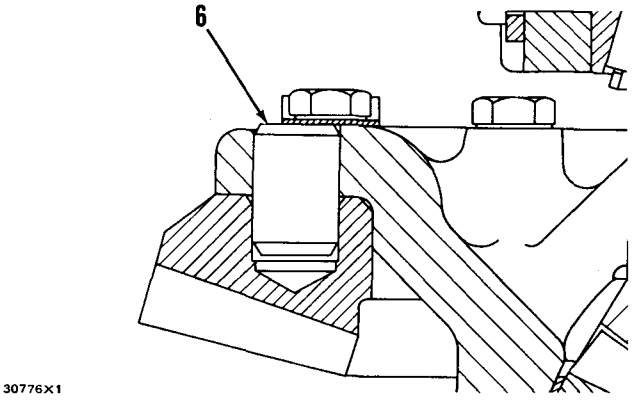
6. Put oil on spider and pinion components. Install the thrust washers and side gear (7) in differential case (3) with the oil groove in thrust washer next to the side gear.



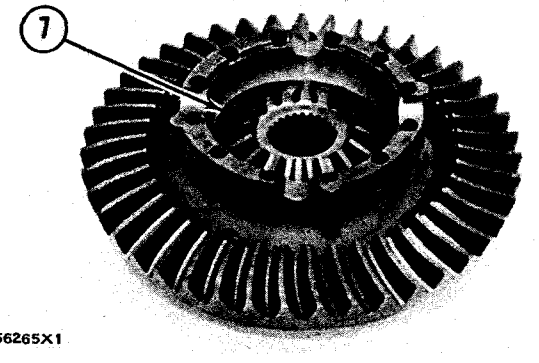
30776–1X1



30776–1X2



30776X1

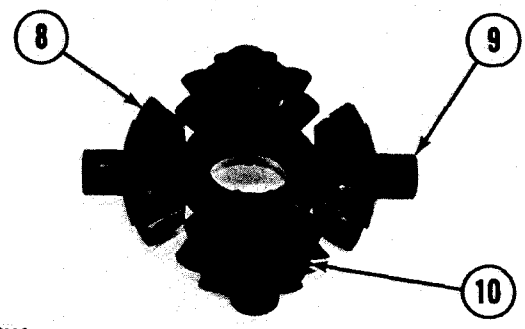


56265X1

DIFFERENTIAL AND CARRIER ASSEMBLY

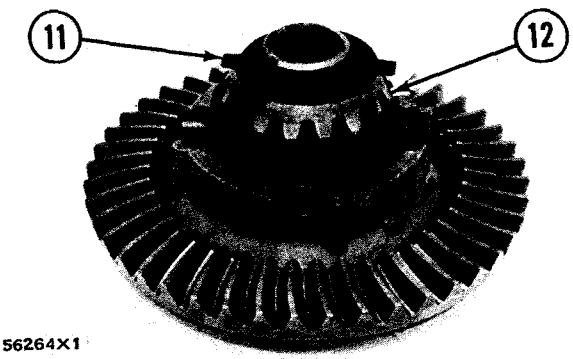
CAUTION: When replacing thrust washers for side gears and cup thrust washers, always replace the washers as a set and never one at a time.

7. Install the cup thrust washers (10) and pinions (8) on spider (9).



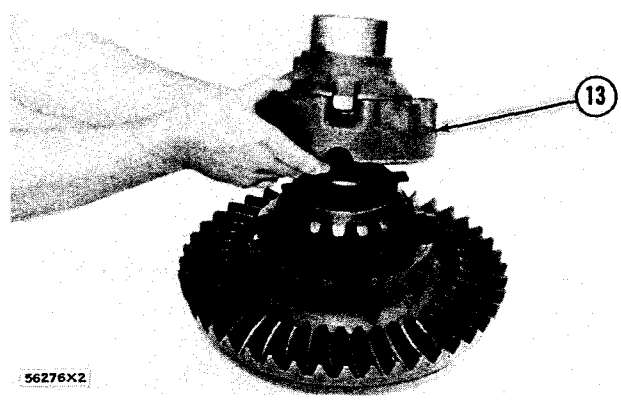
56253X1

8. Put the spider (9) in position in differential case (3).



56264X1

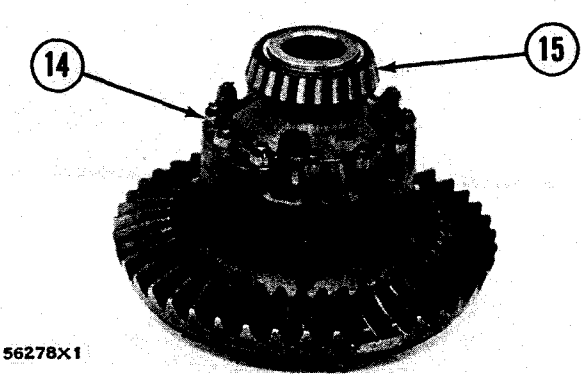
9. Install side gear (12) and thrust washer (11) with groove in washer next to the gear.



56276X2

10. Put differential case (13) into position on case (3) with the marks on each case in alignment with each other. Install the bolts, nuts (14) and cotter pins.

11. Heat the bearing cones of the differential assembly in oil to a maximum temperature of 275°F (135°C). Install the bearing cones (15) on the differential cases.



56278X1

DIFFERENTIAL AND CARRIER ASSEMBLY

12. Assemble the bevel pinion shaft and cage assembly as follows:

    a) Install the bearing cups (17) in cage (16).

    b) Heat the two bearing cones in oil at a maximum temperature of 275°F (135°C).

    c) Install the larger bearing cone on the bevel pinion shaft.

    d) Install pinion shaft in cage (16).

    e) Install small bearing cone on shaft.

    f) Install the two spanner nuts (18) and lock. Tighten nuts until a torque of 8 ± 2 lb.in. (9.2 ± 2.3 cm.kg) is needed to turn the pinion shaft. Make a bend in the lock.

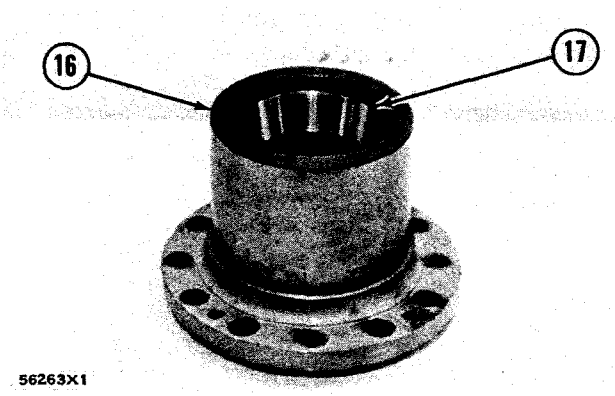
    g) Use tooling (B) to install seal in the retainer (19) with lip of seal toward the inside of retainer.

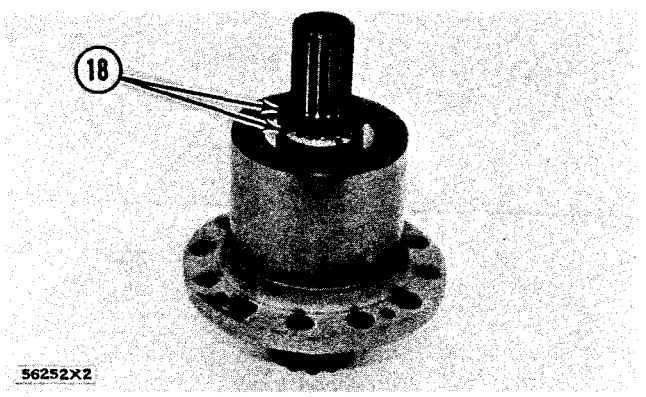
13. Connect a hoist and put carrier assembly (20) on stand (A) as shown.

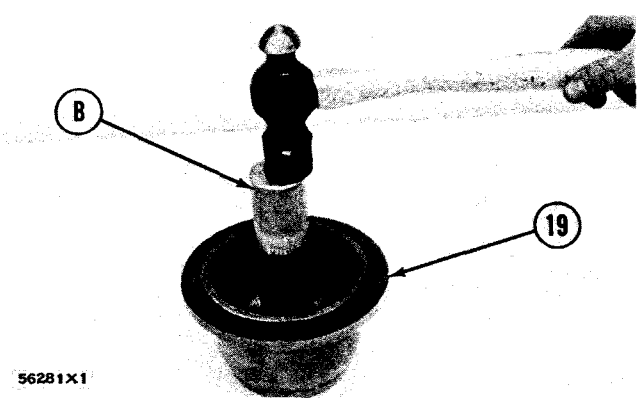
14. Install two 5/8"–11NC x 6 in. guide bolts (23) in carrier assembly. Install shims (22). As a starting point in finding correct bevel pinion location respective to bevel gear, install shims with thickness same as originally used.

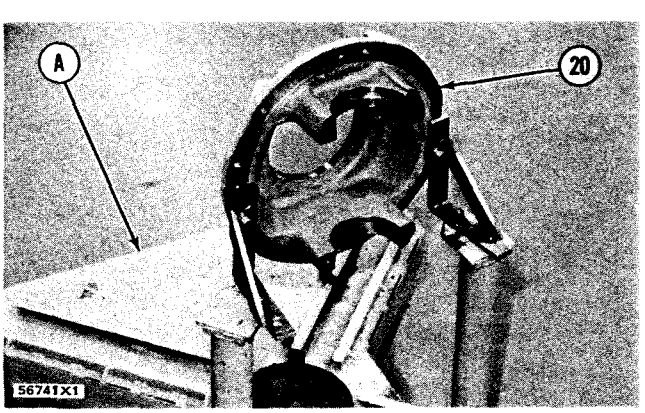
15. Connect a hoist and put pinion shaft and cage assembly (21) in position. Install and tighten two mounting bolts (26). Install retainer (24).

16. Connect a hoist and put differential assembly (25) in carrier in position shown. Install the bearing caps and bearing cups in their respective positions. Install upper and lower adjusting rings. Do not tighten bolts in bearing caps too tight, or adjusting rings can not be installed.









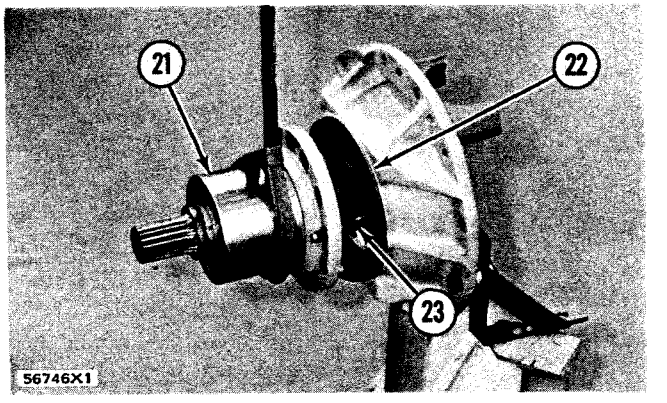
DIFFERENTIAL AND CARRIER ASSEMBLY

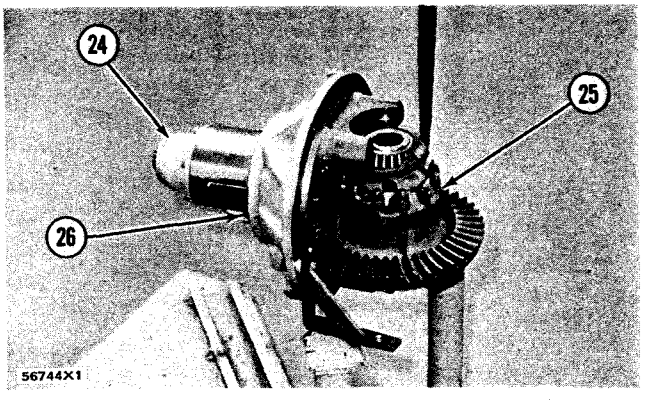
17. Make adjustment for differential bearing preload and for gear clearance (backlash) between bevel gear and pinion using the following procedure:
    a) Install tool group (D) on bevel gear as shown. Tighten lower adjusting ring until there is about .012 in. (0.30 mm) of backlash between bevel gear (4) and pinion. Remove the tooling.
    b) Remove the two bolts (26) from cage assembly. Install a 5/8"–11NC x 6 in. bolt (28). Slide cage assembly (21) free of gear (4).
    c) Install tooling (C) and suitable flat washers. Tighten upper adjusting ring (27) until bearing preload can be felt. Using a torque wrench and tooling (C), check the torque needed to turn differential assembly. Tighten or loosen adjusting ring (27) until 30 ± 5 lb.in. (34.5 ± 5.8 cm.kg) of torque is needed to turn differential assembly.
    d) Slide cage assembly (21) back into position and install the two bolts. Install tool group (D) and check backlash of gear at four different places. Use lowest reading as the backlash value. Backlash must be .008 to .017 in. (0.20 to 0.43 mm).
    e) If backlash is too much, loosen upper adjusting ring (27) and tighten lower adjusting ring same amount. If backlash is not enough, loosen lower ring and tighten upper ring the same amount.

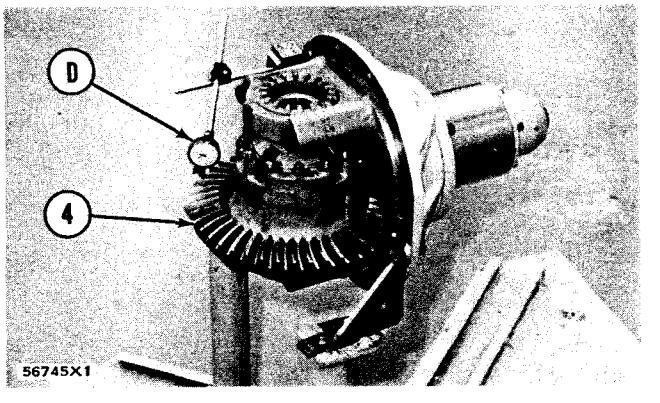
CAUTION: Differential bearing preload will be kept only if the loosening of one ring is followed by the tightening of other ring by same amount.

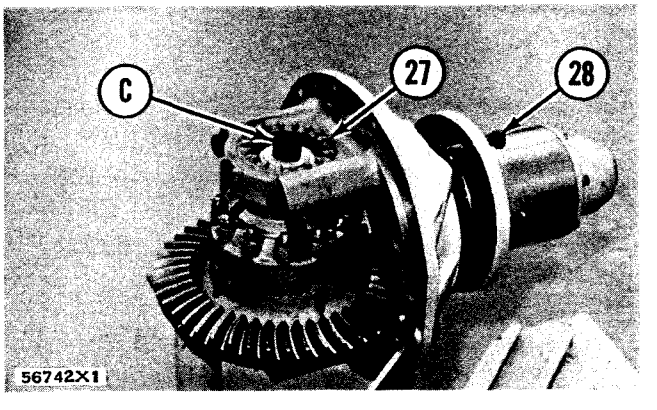
18. Tighten four bolts in the bearing caps.

19. After gear clearance (backlash) and bearing preload adjustment have been made, check tooth contact setting between bevel gear and pinion using following procedure:
    a) Put small amount of prussian blue, red lead, or paint on bevel gear teeth. Turn pinion and check marks made on bevel gear teeth.
    b) With no load, correct tooth contact setting will be as shown. The area of contact starts near toe of gear and goes about 30% up the length of tooth. With this setting, when load is put on gear, it will be over the correct area of teeth.



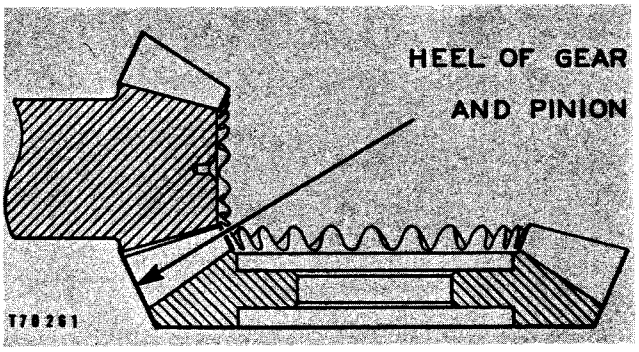






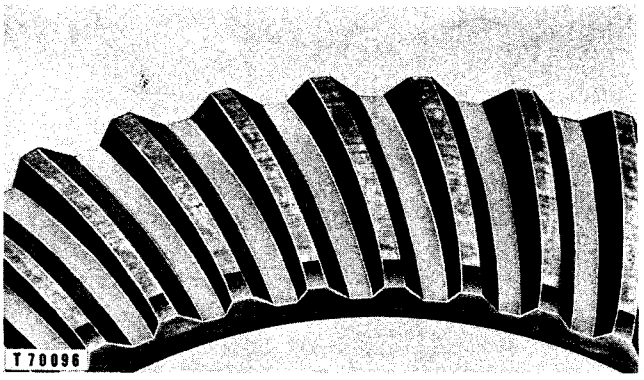
DIFFERENTIAL AND CARRIER ASSEMBLY

c) If bevel pinion shaft is too far away from bevel gear, short toe contact will result as shown. The teeth of pinion will be in contact with toe ends of convex faces (part that makes a curve toward the outside), and top edge of heel end of concave faces (part that makes a curve toward the inside). To correct this, move pinion shaft toward gear by decreasing shim thickness between pinion cage and carrier. After doing this, check gear clearance (backlash) and tooth contact again.



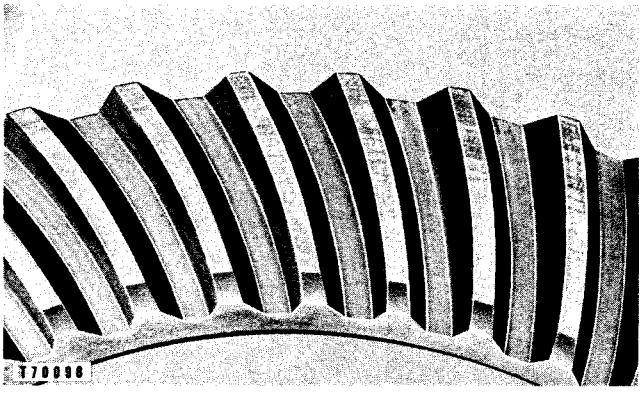
ALIGNING BEVEL GEAR AND PINION

d) If bevel pinion shaft is too near to center of bevel gear, short heel contact will result as shown. The teeth of pinion will be in contact with toe ends of concave faces (part that makes a curve toward the inside) and the heel ends of convex faces (part that makes a curve toward the outside). To correct this, move pinion shaft away from gear by increasing shim thickness between pinion cage and carrier. After doing this, check gear clearance (backlash) and tooth contact again.



CORRECT TOOTH CONTACT SETTING

NOTE: Several adjustments of both pinion and bevel gear can be needed before correct tooth contact setting and gear clearance (backlash) is made. Always remember that a change to gear clearance (backlash) will also change the tooth contact setting. Be sure gear clearance (backlash) is in correct adjustment before checking tooth contact.



SHORT TOE CONTACT SETTING

e) After correct gear clearance (backlash) and tooth contact setting is made, remove extra prussian blue, red lead, or paint from bevel gear and pinion.

20. Install locks and bolts for adjusting rings. Put lockwire on the four bolts for bearing caps. Remove the two guide bolts, and install remainder of bolts that hold cage assembly. Remove differential and carrier assembly from tooling (A). Install the yoke.

end by:

a) install differential and carrier assembly

SHORT HEEL CONTACT SETTING