Disassembly and Assembly
824 & 834 WHEEL TRACTORS 825, 826 & 835 COMPACTORS POWER TRA
Media Number -REG01111-01 **Publication Date -01/04/2004** **Date Updated -09/08/2004**

REG011110014

824-825 Differential And Carrier Assembly

SMCS - 3258-15; 3258-16

Disassemble 824-825 Differential And Carrier Assembly

Tools Needed		A	B	C	D	E
1P2420	Transmission Repair Stand	1				
FT957	Differential Repair Positioning Group	1				
1P820	Hydraulic Puller Group		1		1	1
5F7369	Leg		2		2	2
8B7559	Adapter		2			
8B7561	Step Plate		1			
1H3107	Push Puller			1		
1H3108	Leg			2		
1H3110	Bearing Pulling Attachment			1		1
7F9540	Hydraulic Puller			1		
5F7342	Adapter				2	2
5F7343	Bearing Pulling Attachment				1	
1B4207	Nut		2		2	2
3H465	Plate		4		4	4
1P516	Drive Plate				1	
1P523	Drive Plate					1

start by:

a) remove differential and carrier assembly

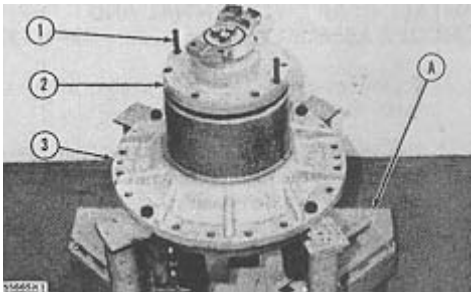
NOTE: The disassembly and assembly of the rear differential and carrier assembly is shown. However, the following procedure is the same for the front differential and carrier assembly except where noted.

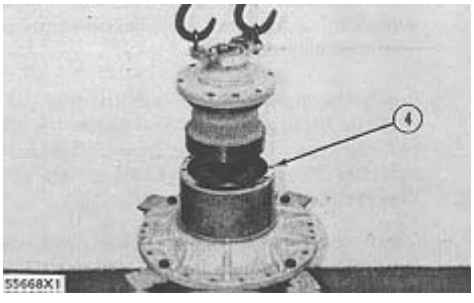
1. Put the differential on tool setup (A) as shown. Fasten a hoist and remove the differential front support (rear differential only). Weight of support is 200 lb (90 kg).

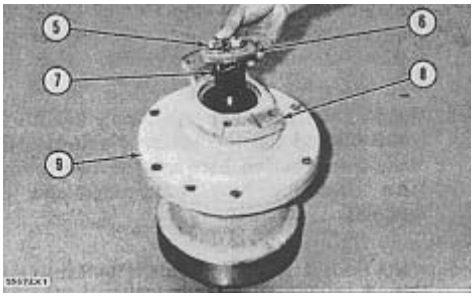
2. Remove bolts from bevel pinion cage (2). Install two 1/2" -13NC forcing screws (1), and make cage (2) free from carrier assembly (3). Remove forcing screws, and install two 1/2" -13NC forged eyebolts. Fasten a hoist and remove the bevel pinion shaft and cage assembly. Weight of assembly is 160 lb (73 kg). Remove and put mark on shims (4) for identification during assembly of differential.

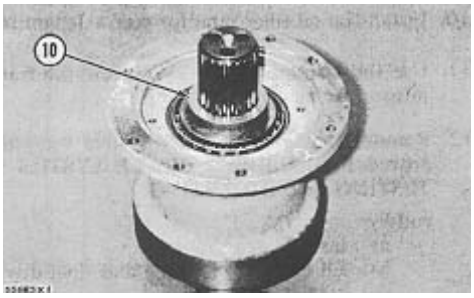
3. Use the following procedure for disassembly of the bevel pinion shaft and cage assembly.

> **a)** Remove flange retaining bolts (5), retainer (6), and shims (7). Put marks on shims for identification. Remove flange (8). Remove the retainer (9). Remove seal from retainer. Remove spacer (10).









b) Install tool setup (B), and make the pinion shaft (12) free of the cage.
c) Remove bearing cone (11) from cage. Remove the two bearing cups from cage.
d) Remove shims from pinion shaft.
e) Use tool setup (C) and a suitable spacer to remove the bearing cone (13) from bevel pinion shaft.

4. Fasten a hoist and put the differential on the stand (A) as shown. Remove lock wire (15), and put identification marks on bearing caps (18) and (19) to make sure caps are installed back in their correct positions.

5. Remove locks from adjusting rings (16) and (17).

6. Loosen the adjusting rings (16) and (17).

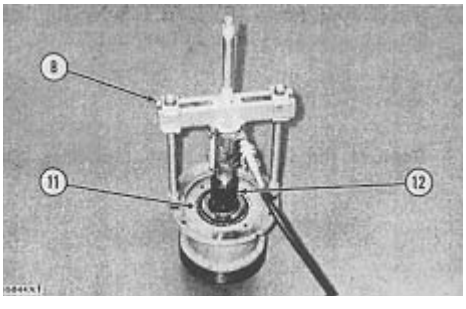
7. Remove the cap retaining nuts (14).

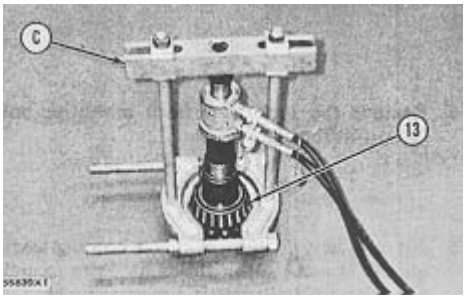
8. Remove caps (18) and (19). Remove the dowels from bearing cages (21) and (22).

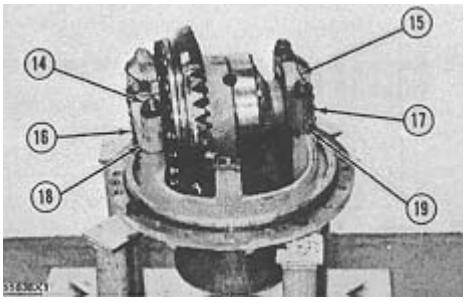
9. Fasten a hoist and remove the differential assembly (20). Weight is 250 lb. (113 kg).

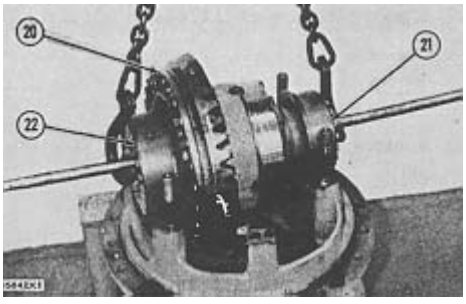
10. Remove the adjusting rings (16) and (17), and bearing cages (21) and (22) from differential assembly.

11. Remove the bearing cups from cages (21) and (22).









12. Install tool setup (E), and remove the large bearing cone (23) from differential.

13. Remove the lock wire from mounting bolts (24).

14. Turn over the differential. Install tool setup (D), and remove the small bearing cone (25) from differential.

15. Remove the lock wire from mounting bolts (26) of differential housing.

16. Put an identification mark on housing assemblies (27) and (29) in the same place to make sure of correct alignment during assembly.

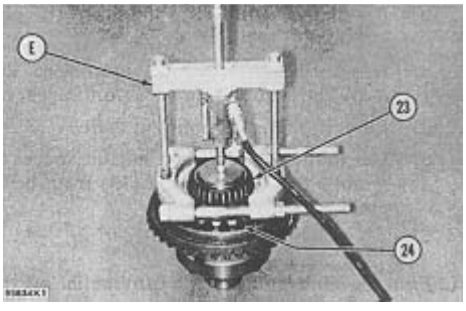
17. Remove the mounting bolts (26) from the differential housing.

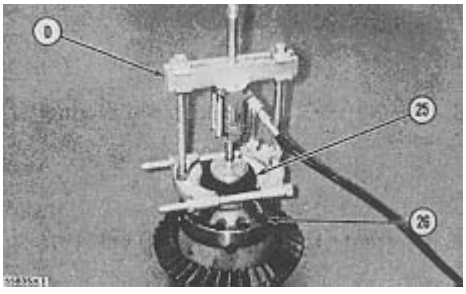
18. Remove differential housing (27).

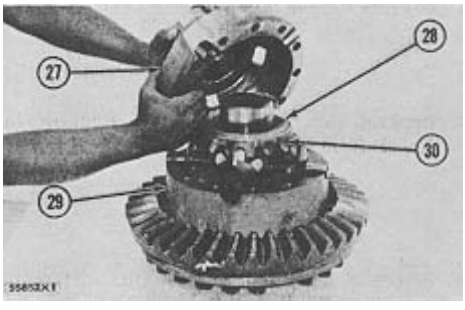
19. Remove thrust washer (28) and side gear (30).

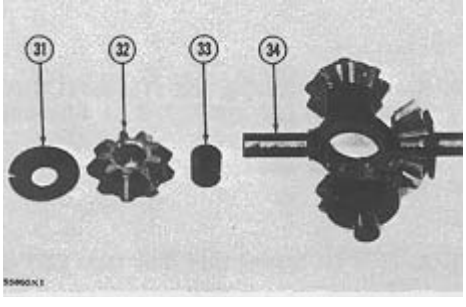
20. Remove the spider and pinions as a single piece.

21. Remove the thrust washers (31), pinions (32), and floating bearings (33) from spider (34).









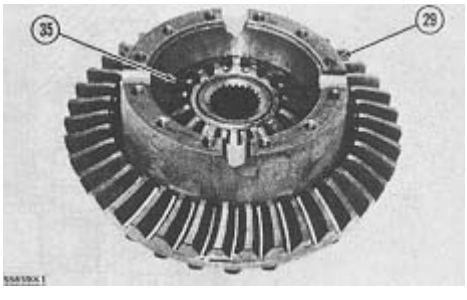
22. Remove the side gear (35) and thrust washer from differential housing (29).

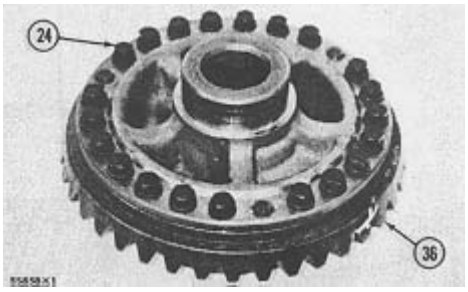
23. Remove the bolts (24) that fasten the bevel gear to differential housing.

24. Make the bevel gear (36) free of housing (29).

25. Fasten a hoist and remove differential housing (29). Weight of housing is 90 lb (40 kg). The weight of bevel gear is 50 lb (22 kg).

26. Remove the wiper and tube assembly (37) from the carrier assembly.

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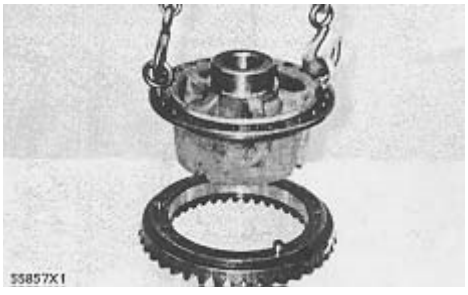
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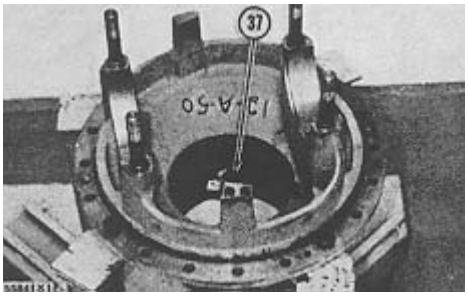
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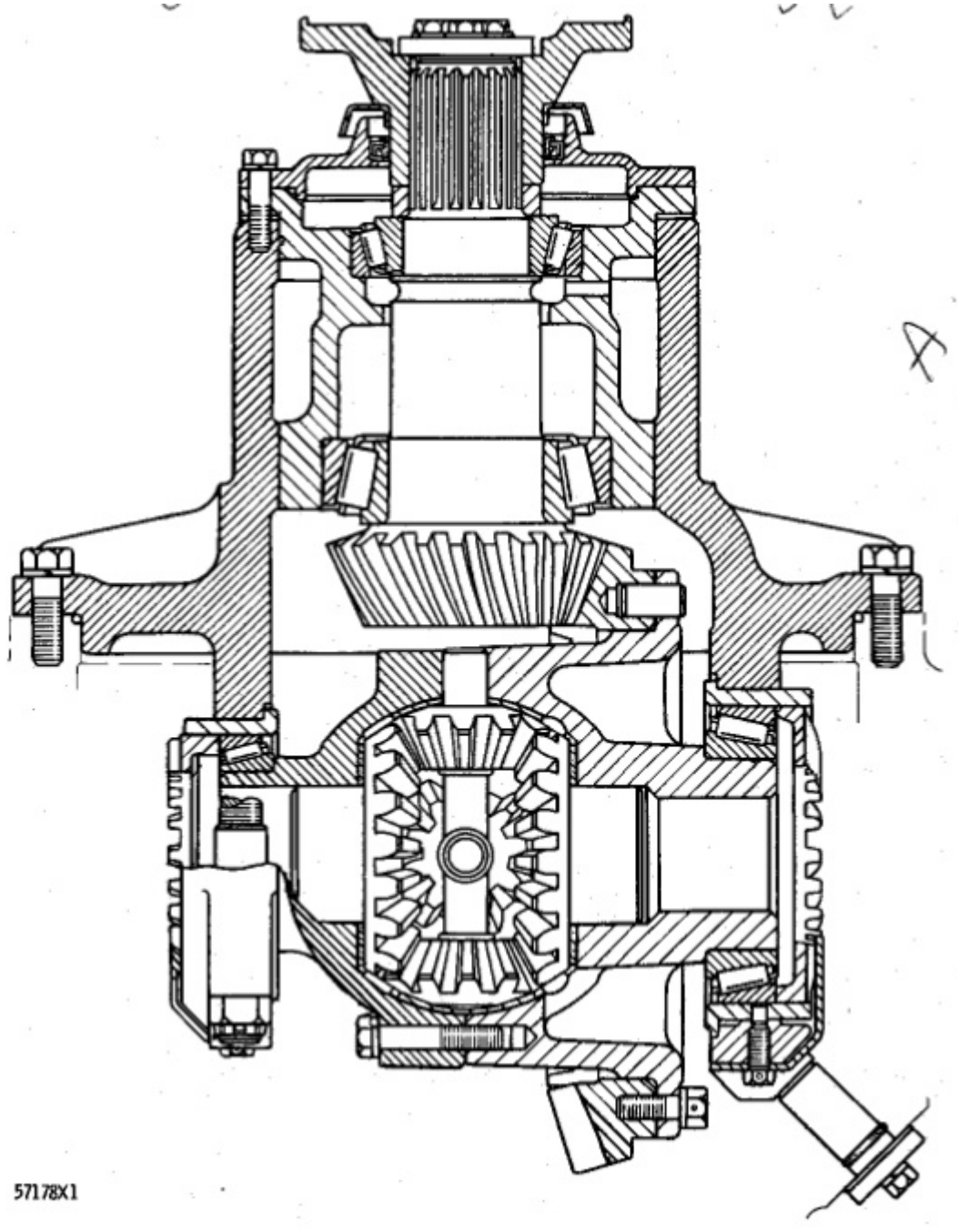


Assemble 824-825 Differential And Carrier Assembly

Tools Needed		A	B	C	D
1P2420	Transmission Repair Stand	1			
FT957	Differential Repair Positioning Group	1			
8B7554	Bearing Cup Pulling Attach.		1		
7S7786	Leg		2		
V459	Bolt (5/8"–18NF X 4 in. long)		1		
9S1354	Nut		1		
8S2328	Dial Test Indicator Group			1	
1P523	Drive Plate				1
1P529	Handle				1

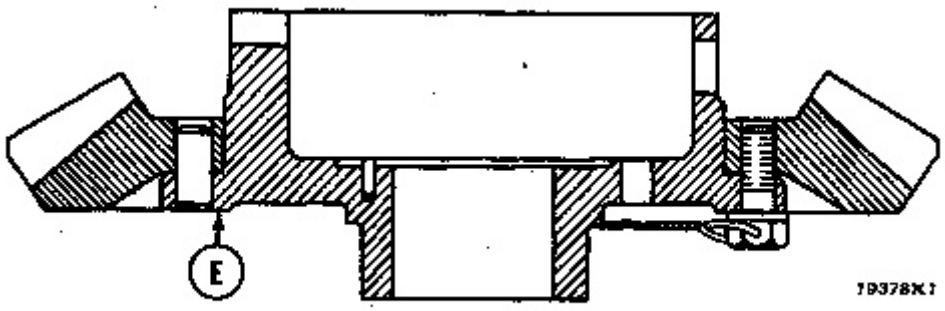
1. Put the bevel gear in position on the differential housing.

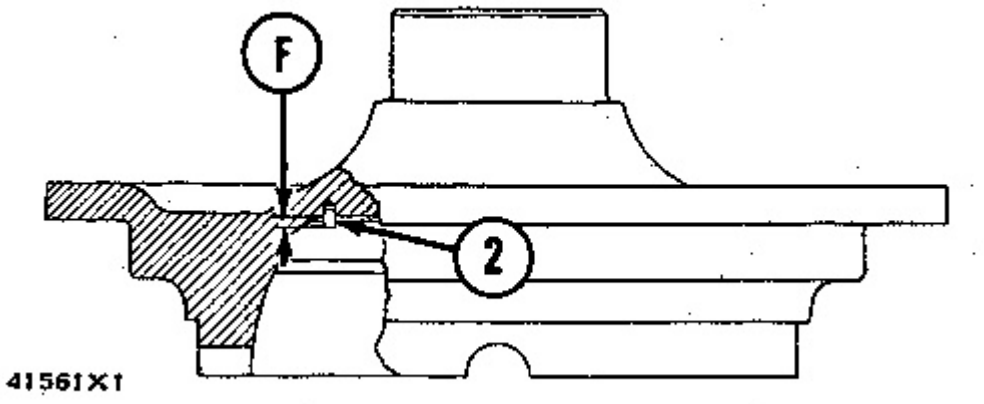
CAUTION: Make sure the flange on differential housing and the contacting surface of bevel gear are clean and free of burrs.

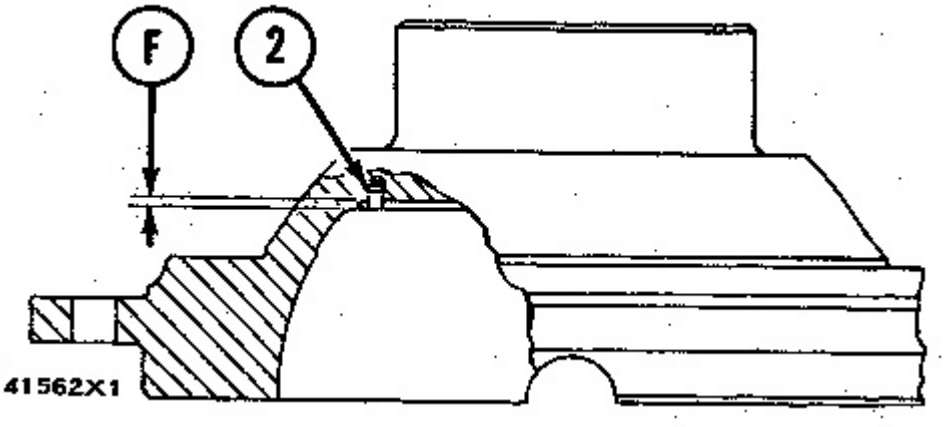
2. Put oil on the faces of washers and on the threads of the bolts that fasten the bevel gear to the differential housing. Install the bolts and washers. Tighten all bolts the same amount until they have a torque of 210 ± 15 lb.ft. (29,0 ± 2,1 mkg). Install the lock wire on the bolts, seven bolts at a time.

3. Check the alignment of the dowel holes in the bevel gear and the differential housing if a new gear and/or housings are being installed. If the original bevel gear and housings are being used again, the dowels (1) must fit tight in both the gear and the housing. If the dowel holes are not in correct alignment, or if the original dowels do not fit tightly, use the following procedure:

a) Make the original dowel holes larger by line reaming them to a diameter .9060 ± .0005 in (23,01 ± 0,0127 mm) and to a depth of 1.50 in (38,10 mm).
b) Install the larger service dowels with the ends of dowels .125 in (3,175 mm) above the face (E) of differential housing.
c) If new differential housings are being installed, install new thrust washer dowels (2) on inside of differential housings so dimension (F) will be .145 ± .002 in (3,68 ± 0,05 mm) for side gear thrust washers and .114 ± .002 in (2,89 ± 0,05 mm) for cup thrust washers.







4. Put oil on the spider and pinion components before assembling.

5. Install thrust washer and side gear (3) in differential housing (4).

CAUTION: When installing side gear thrust washers and cup thrust washers, make sure washers are correctly positioned on the dowels in differential housings. When replacing thrust washers for side gears and cup thrust washers, always replace the washers as a set and never one at a time.

6. Install the floating bearings, pinions, and cup thrust washers on the spider.

7. Put the spider and pinion assembly (5) in position in the differential housing (4).

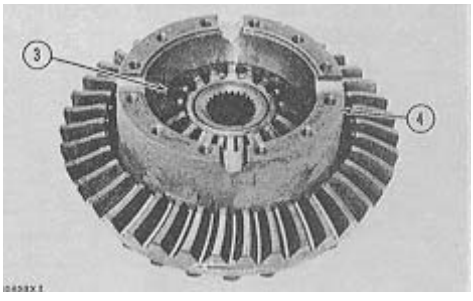
8. Install side gear (7) and thrust washer.

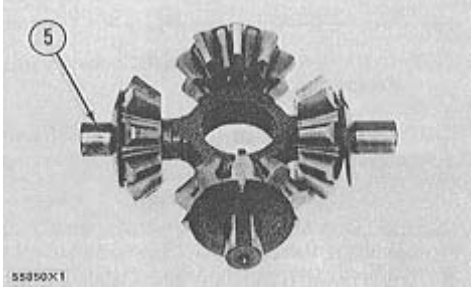
9. Put the differential housing (6) in position on differential housing and bevel gear.

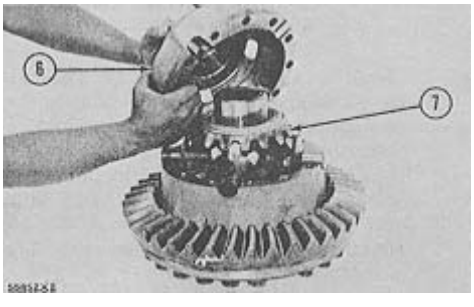
NOTE: Be sure the alignment marks on the two housings are in alignment with the notches in thrust washers are in alignment with dowels in housing (6).

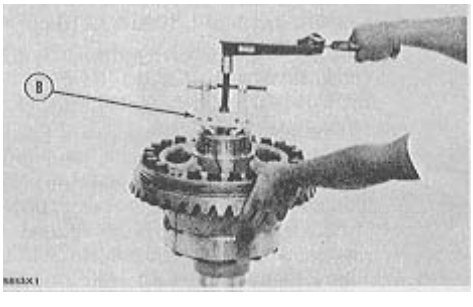
10. Install the bolts that fasten the two housings together. Tighten bolts to 150 ± 20 lb.ft. (20,7 ± 2,8 mkg). Install the lock wire.

11. Use tool setup (B) and a torque wrench to check the torque needed to turn the differential group. The maximum torque needed to turn the group through two complete revolutions in each direction should not be more than 25 lb.ft. (3,5 mkg).









12. Heat the bearing cones of the differential assembly in oil to a maximum temperature of 275°F (135°C). Install the large and small bearing cones on their respective differential housings.

13. Install the bearing cups in bearing cages (9) and (10).

14. Put the bearing cages in position on differential housings. Install the adjusting rings (11) and (12). Do not tighten the adjusting rings at this time.

15. Fasten a hoist and put the carrier assembly in position on stand (A) with input end of the carrier assembly down.

16. Install wiper and tube assembly (8) in the carrier assembly.

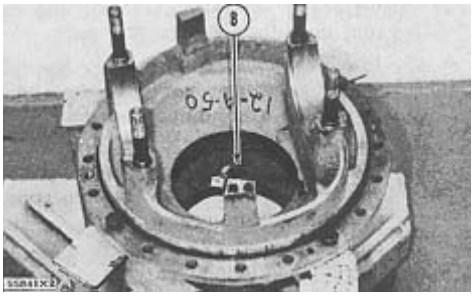
17. Fasten a hoist and put the differential assembly on carrier assembly with bearing cage dowel holes (15) and (16) in position shown. Install the two dowels (13) and (14).

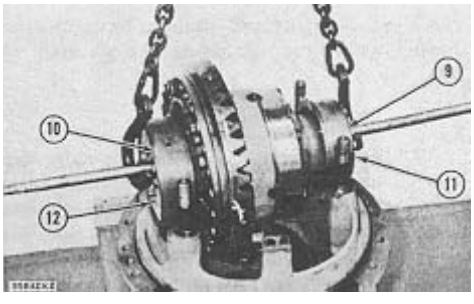
18. Put bearing caps (17) and (18) in their respective positions on carrier assembly.

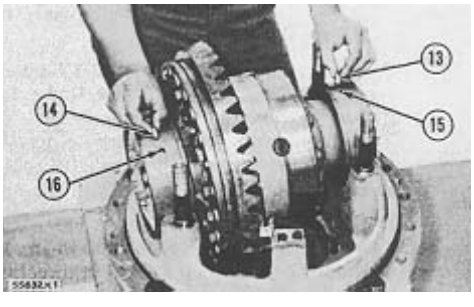
CAUTION: Always install bearing caps back in their original positions on carrier assembly with dowels (13) and (14) in alignment with dowel holes in bearing cages and bearing caps.

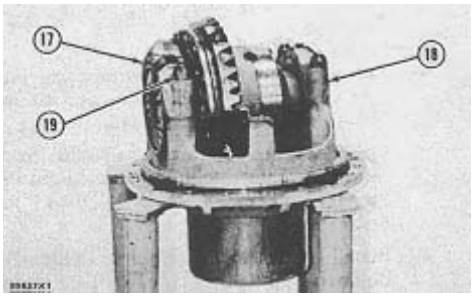
19. Install retaining nuts (19) for bearing caps. Tighten nuts to 615 ± 115 lb.ft. (85,1 ± 15,9 mkg).

20. Fasten a hoist and put the differential and carrier assembly in position on stand (A) so the input end of carrier assembly is in the up direction.







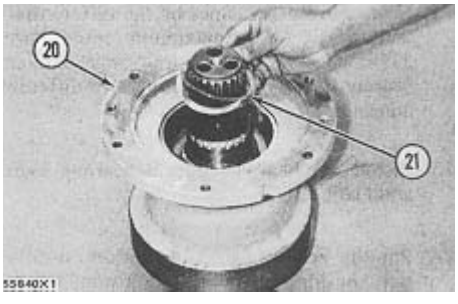


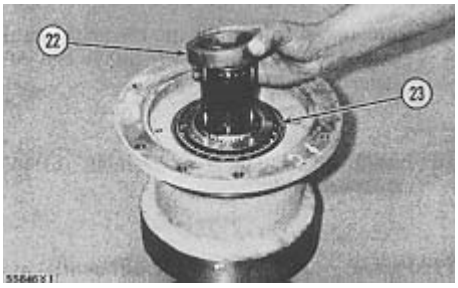
21. Assemble the bevel pinion shaft and cage assembly using the following procedure:

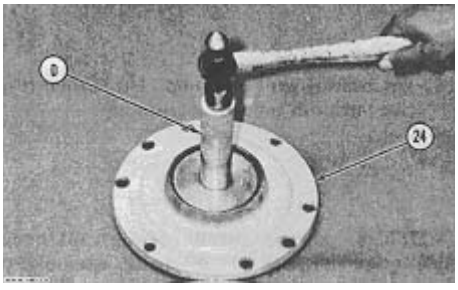
a) Install the two bearing cups in cage (20). Heat the bearing cones of the bevel pinion in oil to a maximum temperature of 275°F (135°C).
b) Install the inner bearing cone on bevel pinion shaft. Make sure bearing cone is against shoulder of shaft.
c) Put the bevel pinion shaft in cage (20). Install about .050 in (1,27 mm) thickness of shims (21) on shaft.

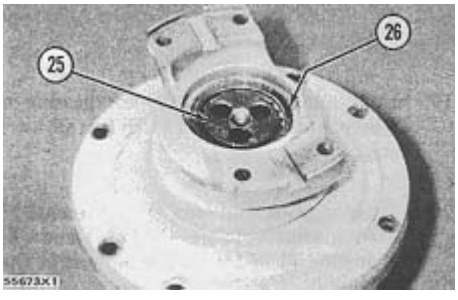
NOTE: This thickness of shims is to be used as a starting point only in setting correct shaft end play.

d) Install bearing cone (23) on shaft. Make sure bearing cone is against shims. Install spacer (22) and flange. Install the flange retainer (without shims) and the three bolts. Tighten bolts the same amount.
e) Support cage (20) on blocks. Use tool setup (C) to check pinion shaft end play by raising and lowering pinion shaft. End play should be .005 ± .002 in (0,13 ± 0,05 mm).
f) If end play is not correct, remove retainer, bolts, flange, and spacer. Use tool setup (B) to make pinion shaft free of cage. Add or remove shims as necessary to get the correct end play. Put pinion shaft back in cage, and install outer bearing cone and spacer.
g) Use tool setup (D) to install seal in the retainer (24) with lip of seal in direction of bearing cones. Put oil on lip of seal. Put retainer (24) on cage, and install the flange and retainer (without shims). Tighten bolts to 130 ± 20 lb.ft. (18,0 ± 2,8 mkg).
h) Remove input flange retainer and bolts. Measure the distance from end of shaft (25) to mounting face (26) of retainer.
i) Install O-ring seal on end of shaft. Install shims of same thickness as measured distance minus .003 ± .001 in (0,076 ± 0,025 mm).
j) Install the retainer and bolts. Tighten the bolts to 200 ± 20 lb.ft. (27,7 ± 2,8 mkg).









22. Put shims (27) on carrier assembly. As a starting point in finding correct level pinion location respective to bevel gear, install shims with thickness the same as originally used.

23. Fasten a hoist and put the pinion shaft and cage assembly in position on stand (A) so that the axle centerline is vertical and teeth of bevel gear are up as shown.

24. Fasten a hoist and put differential and carrier assembly in position on stand (A) so that the axle centerline is vertical and the teeth of bevel gear are up as shown.

25. Use tool setup (C) to make the adjustment for differential bearing preload and for backlash (free motion between gears) between bevel gear and pinion. The adjustment procedure follows:

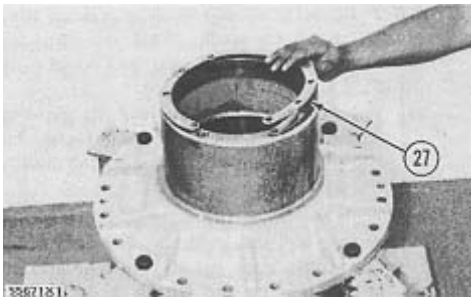
> **a)** Install tool setup (C) on bevel gear as shown. Tighten lower adjusting ring (12) until there is about .014 in (0,36 mm) of backlash (free motion) between bevel gear (28) and pinion.

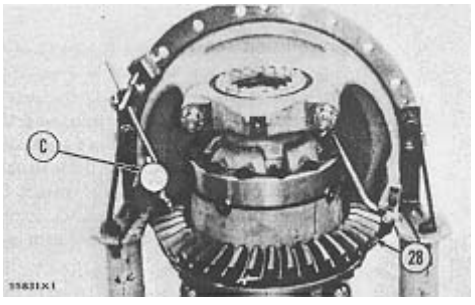
NOTE: Check the backlash with position of bevel pinion shaft as close as possible in the direction of centerline of bevel gear. Use a bar to hold pinion shaft in this position while checking the backlash.

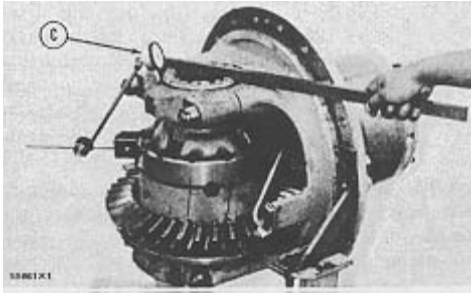
> **b)** Remove tool setup (C). Tighten the upper adjusting ring (11) while turning bevel gear (28) until bearing preload can be felt. Install tool setup (C), and go on tightening adjusting ring to maximum preload possible without increasing dimension (X), between bearing cap (18) and differential assembly, more than .005 in (0,13 mm).
> **c)** Again check the backlash between bevel gear and pinion shaft at four different places on the bevel gear. Take the lowest reading as the backlash value. Backlash should be .014 ± .002 in (0,36 ± 0,05 mm).

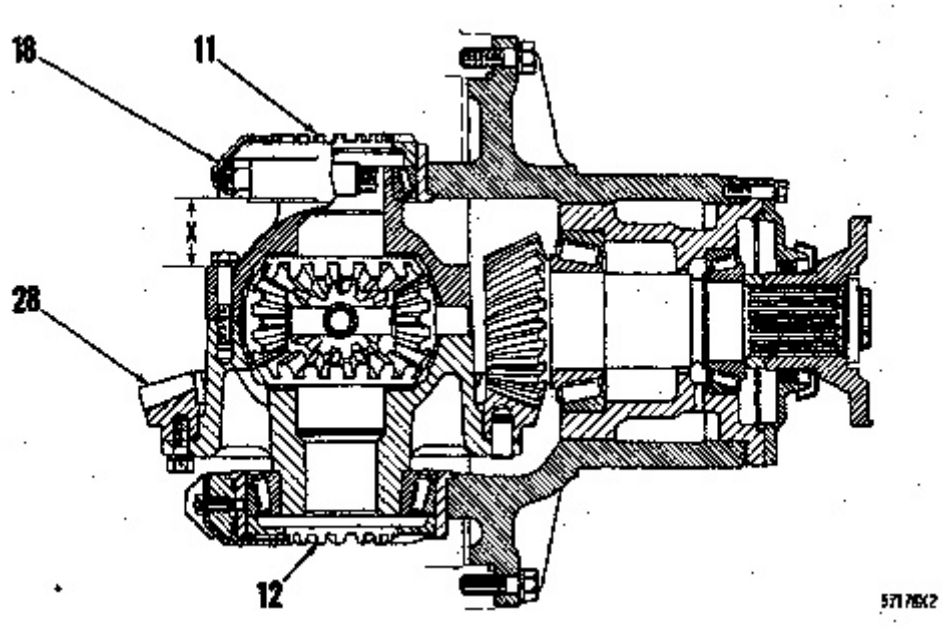
d) If backlash is too much, loosen adjusting ring (11) and tighten adjusting ring (12) by the same amount. If backlash is not enough, loosen ring (12) and tighten ring (11) by the same amount.

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









26. After the backlash and bearing preload adjustments have been made, check the tooth contact between the bevel gear and bevel pinion using the following procedure.

a) Put prussian blue, red lead, or paint in a small amount on bevel gear teeth. Turn the pinion, and check the marks made on the bevel gear.
b) With no load, the correct tooth contact setting will be as shown. The area of contact starts near the toe of gear and goes about 30% up the length of tooth. With this setting, when load is put on gears, it will be applied 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 and top edge of heel end of concave faces. To correct this, move pinion shaft in direction of gear by decreasing thickness of shims between bevel pinion shaft cage and carrier. After doing this, the backlash and the tooth contact again.
d) If bevel pinion shaft is too near to the centerline of bevel gear, short heel contact will result as shown. The teeth of pinion will be in contact with toe ends of concave faces and the heel of convex faces. To correct this, move pinion shaft in opposite direction of gear by increasing thickness of shims between bevel pinion shaft cage and carrier. After doing this, check backlash and tooth contact again.

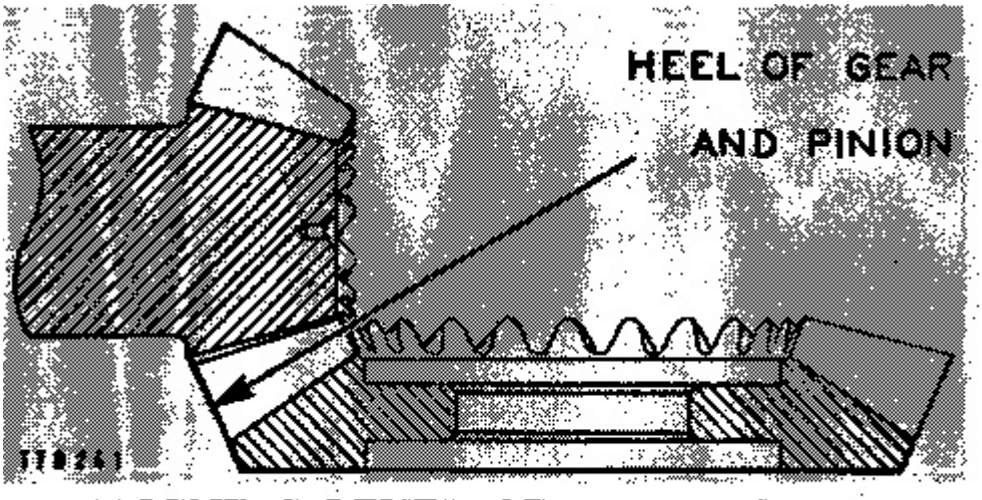
NOTE: Several adjustments of both the pinion and bevel gear may be necessary before correct tooth contact setting and backlash is made. Always remember that a change in backlash will also result in a change in tooth contact setting. Therefore, be sure the backlash is in correct adjustment before checking both contact setting.

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

27. Install locks on adjusting rings. Install lock wire on cap fastening nuts and lock bolts. Fasten hoist and install front support (rear only).

end by:

a) install differential and carrier assembly



ALIGNING BEVEL GEAR AND PINION

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