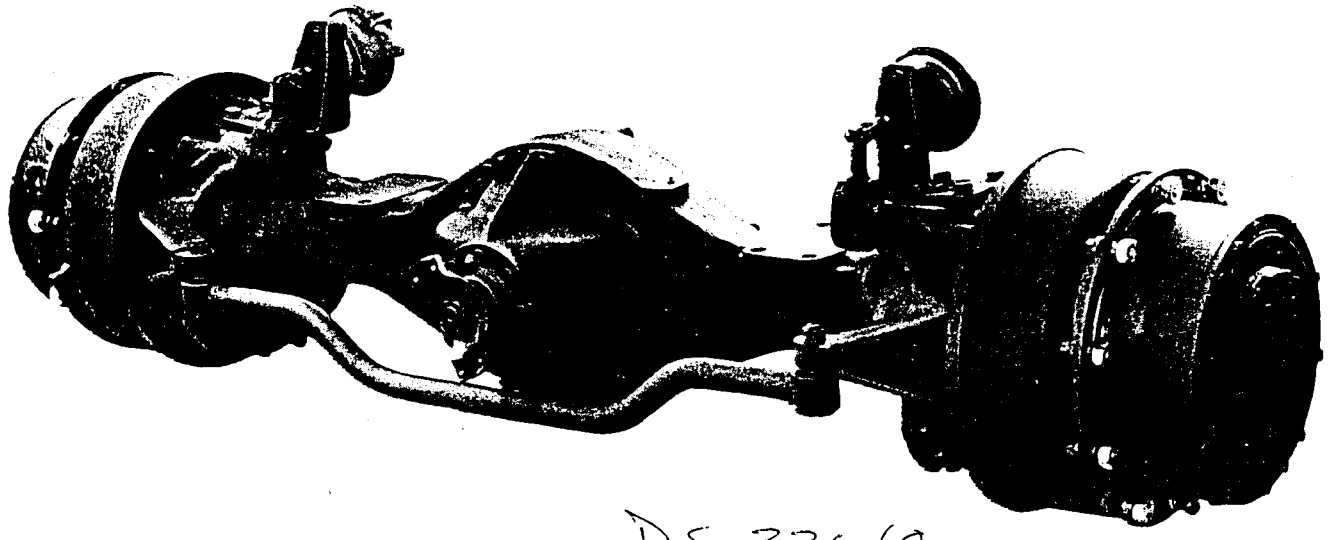
CLARK®

AXLE

MAINTENANCE & SERVICE MANUAL



DS 33640

22,500 22,600 22,700

SERIES DRIVE STEER AXLE

CLARK EQUIPMENT COMPANY

CUSTOMER SERVICE DIVISION

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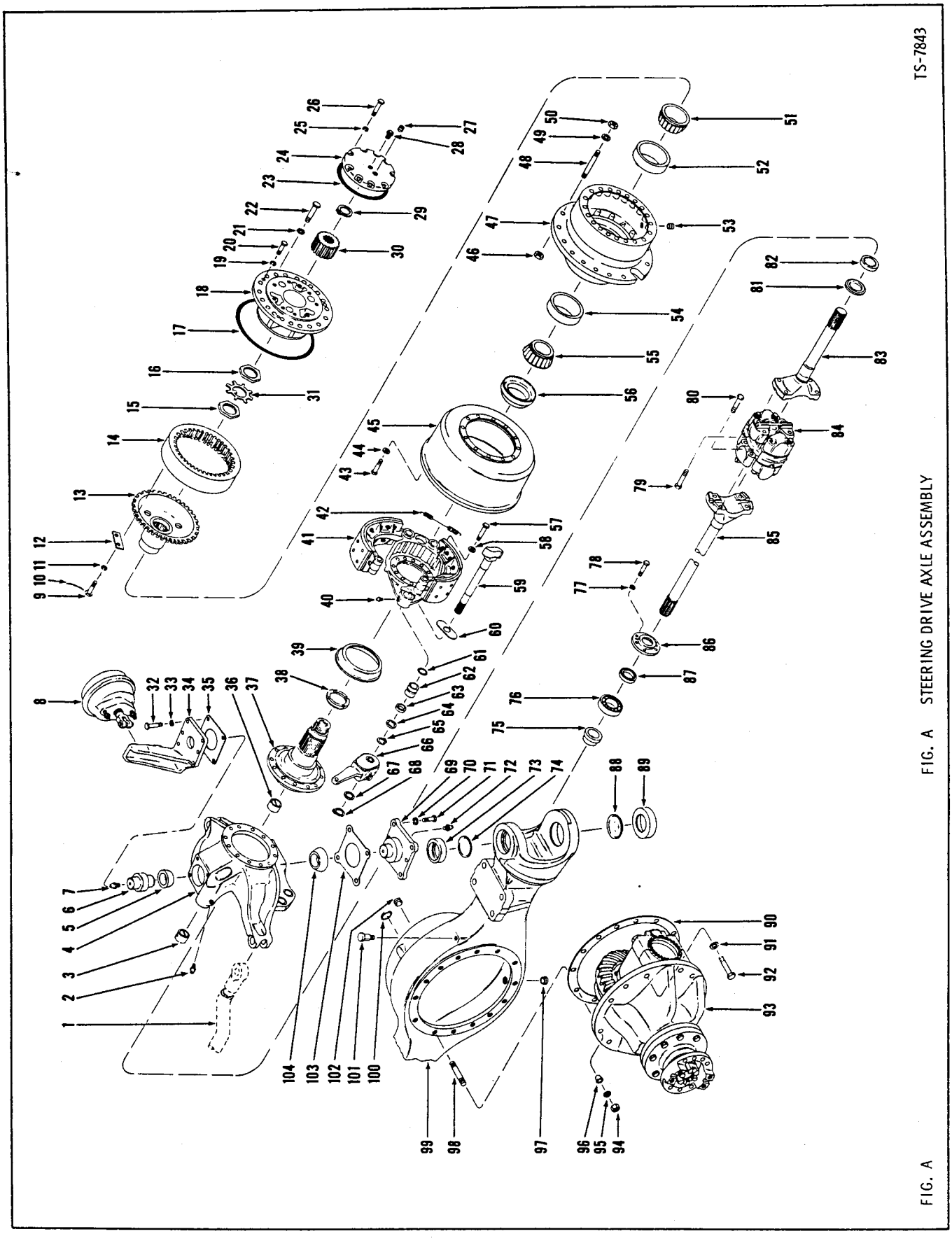


FIG. A STEERING DRIVE AXLE ASSEMBLY

FIG. A

CLARK EQUIPMENT

STEERING DRIVE AXLE ASSEMBLY

Item No.	Description	No. Req'd.
1	TIE ROD	1
2	FITTING, Support Bushing Grease	2
3	BUSHING, Spindle Support	2
4	SUPPORT ASSEMBLY, Spindle	1
5	CONE, Bearing	2
6	TRUNNION, Steering – Upper	2
7	FITTING, Upper Trunnion Grease	2
8	AIR CHAMBER	2
9	BOLT, Hub to Gear	24
10	LOCKWIRE – 18 Gauge	AR
11	LOCKWASHER, Hub to Gear	24
12	PLATE, Hub to Gear Retaining	12
13	HUB, Internal Gear	2
14	GEAR, Internal Ring	2
15	NUT, Inner Spindle	2
16	NUT, Outer Spindle	2
17	"O" RING, Planet Carrier	2
18	PLANET CARRIER	1
19	LOCKWASHER, Planet Puller Hole	6
20	BOLT, Planet Puller Hole	6
21	WASHER, Planet Carrier to Hub	40
22	BOLT, Planet Carrier to Hub	40
23	"O" RING, Thrust Cap	2
24	THRUST CAP, Sun Gear	2
25	LOCKWASHER, Thrust Cap to Planet Carrier	18
26	BOLT, Thrust Cap to Planet Carrier	18
27	PLUG, Thrust Cap	2
28	VALVE, Thrust Cap Relief	2
29	RING, Sun Gear Retaining	2
30	SUN GEAR	2
31	LOCK, Spindle Nut	2
32	BOLT, Bracket to Support	8
33	LOCKWASHER, Bracket to Support	8
34	BRACKET, Air Chamber	1
35	SHIM, Bracket Mounting	AR
36	BUSHING, Spindle	2
37	SPINDLE ASSEMBLY	2
38	RING, Sun Gear Thrust	2
39	CATCHER, Oil	2
40	FITTING, Brake Spider Grease	2
41	BRAKE ASSEMBLY	2
42	SPRING, Brake Shoe Return	2
43	BOLT, Brake Drum to Hub	24
44	WASHER, Brake Drum to Hub	24
45	DRUM, Brake	2
46	NUT, Wheel Stud	38
47	HUB ASSEMBLY	2
48	STUD, Wheel	38
49	WASHER, Wheel Nut	38
50	NUT, Wheel	38
51	CONE, Outer Hub Bearing	2
52	CUP, Outer Hub Bearing	2
53	PLUG, Hub Drain or Fill	2
54	CUP, Inner Hub Bearing	2
55	CONE, Inner Hub Bearing	2
56	SEAL, Hub Oil	2
57	BOLT, Brake & Spindle to Support	24
58	WASHER, Brake & Spindle to Support	24
59	CAM SHAFT, Brake	2
60	WASHER, Cam Shaft Thrust	2
61	"O" RING, Cam Shaft	2
62	BUSHING, Brake Spiker	2
63	RETAINER, Cam Shaft Grease	2
64	WASHER, Cam Shaft Retaining	2
65	RING, Cam Shaft Retaining	2
66	ADJUSTER, Slack	2
67	WASHER, Slack Adjuster Retaining	2
68	RING, Slack Adjuster Retaining	2
69	TRUNNION, Steering – Lower	2
70	LOCKWASHER, Trunnion to Support	8
71	BOLT, Trunnion to Support	8
72	FITTING, Lower Trunnion Grease	2
73	CUP, Bearing	2
74	PLUG, Housing Expansion – Upper	2
75	SLEEVE, Axle Shaft	2
76	BEARING, Axle Shaft	2
77	LOCKWASHER, Bearing Retainer	12
78	BOLT, Bearing Retainer	12
79	BOLT, U-Joint to Wheel Shaft	8
80	BOLT, U-Joint to Axle Shaft	8

AR - As Required

CLARK EQUIPMENT

STEERING DRIVE AXLE ASSEMBLY (Continued)

Item No.	Description	No. Req'd.
81	WASHER, Wheel Shaft Oil Seal	2
82	SEAL, Wheel Shaft Oil	2
83	SHAFT, Wheel	2
84	U-JOINT ASSEMBLY	2
85	SHAFT, Axle	2
86	RETAINER, Axle Shaft Bearing	2
87	SEAL, Axle Shaft Oil	2
88	PLUG, Housing Expansion – Lower	2
89	CUP, Bearing	2
90	GASKET, Differential & Carrier	1
91	WASHER, Carrier to Housing	10
92	BOLT, Carrier to Housing	10
93	DIFFERENTIAL AND CARRIER ASSEMBLY	1
94	NUT, Carrier to Housing	4
95	WASHER, Carrier to Housing	4
96	DOWEL, Carrier to Stud	4
97	PLUG, Housing Drain	4
98	STUD, Carrier to Housing	4
99	HOUSING, Axle	1
100	PLUG, Housing Expansion	1
101	BREATHER, Axle Housing	1
102	PLUG, Housing Filler	1
103	SHIM, Trunnion Mounting	AR
104	CONE, Bearing	2

AR - As Required

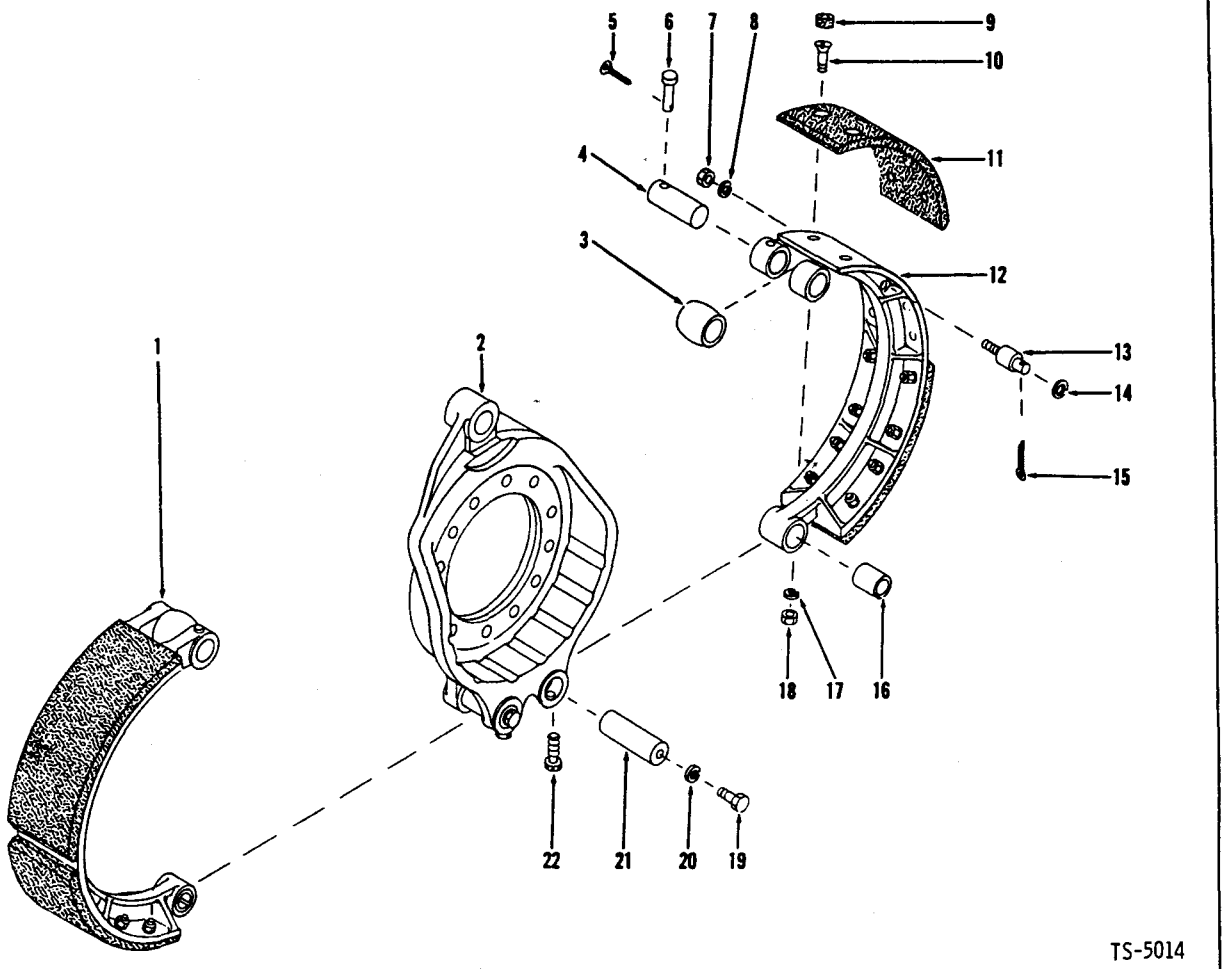


FIG. B TS-5014

BRAKE ASSEMBLY

Item No.	Description	No. Req'd.
1	SHOE ASSEMBLY, Brake	2
2	SPIDER, Brake	1
3	ROLLER, Brake Cam	2
4	PIN, Brake Cam Roller	2
5	COTTER, Roller Pin Lock Pin	2
6	PIN, Cam Roller Pin Lock	2
7	NUT, Spring Anchor Pin	2
8	LOCKWASHER, Spring Anchor Pin	2
9	PLUG, Brake Lining	32
10	SCREW, Lining to Shoe	32
11	LINING, Brake Shoe	4
12	SHOE, Brake	2
13	PIN, Spring Anchor	2
14	WASHER, Spring Anchor Pin	2
15	COTTER, Spring Anchor Pin	2
16	BUSHING, Brake Shoe	2
17	LOCKWASHER, Lining to Shoe	32
18	NUT, Lining to Shoe	32
19	BOLT, Puller Hole Plug	2
20	LOCKWASHER, Puller Hole Plug	2
21	PIN, Brake Shoe Anchor	2
22	SCREW, Anchor Pin Set	2

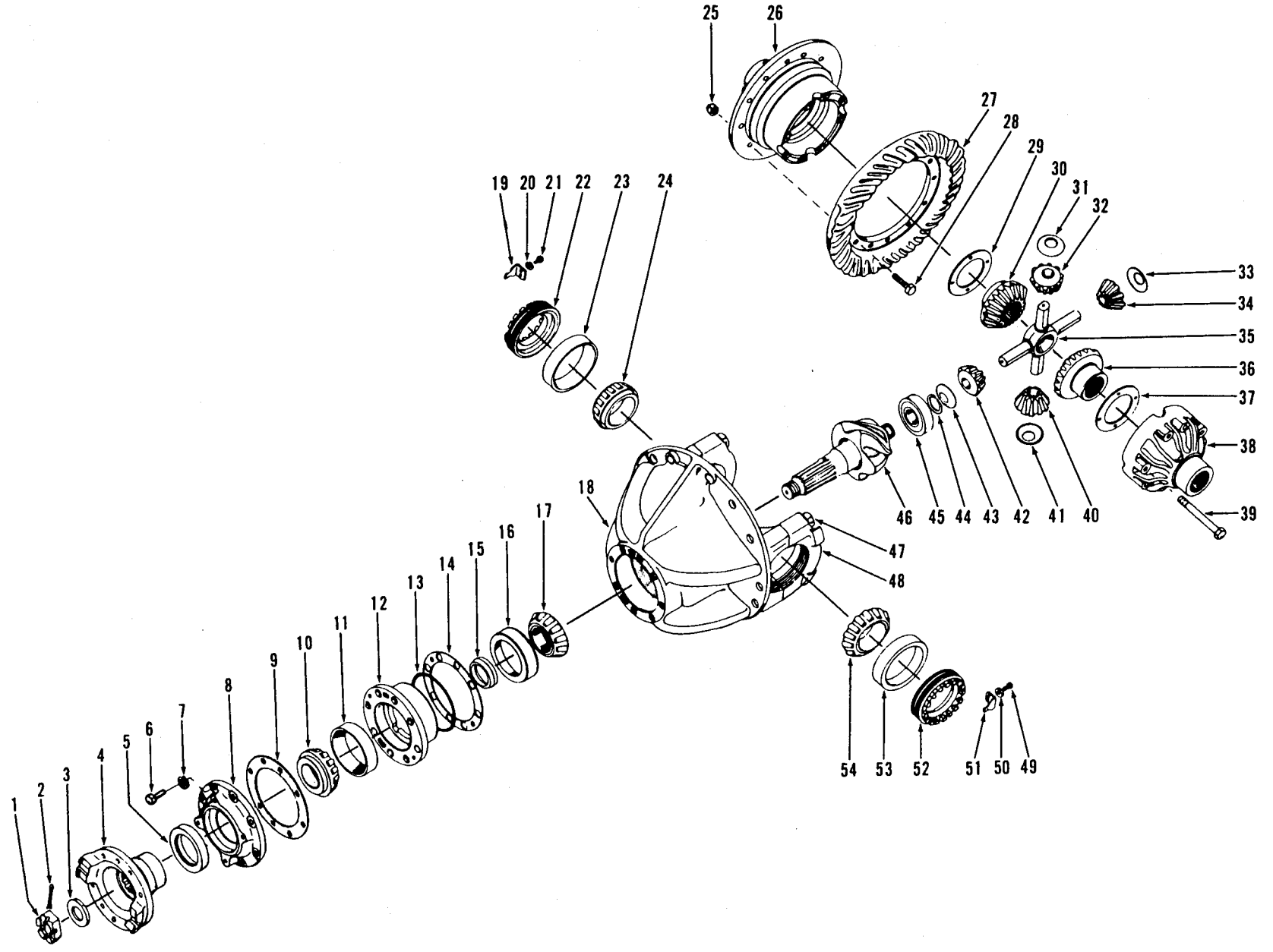


FIG. C

FIG. C DIFFERENTIAL AND CARRIER ASSEMBLY

TS-4989

DIFFERENTIAL AND CARRIER ASSEMBLY

Item No.	Description	No. Req'd.
1	NUT, Pinion Shaft	1
2	COTTER, Pinion Shaft Nut	1
3	WASHER, Pinion Shaft	1
4	FLANGE, Companion	1
5	SEAL, Pinion Oil	1
6	BOLT, Pinion Oil Seal Retainer	8
7	LOCKWASHER, Pinion Oil Seal Retainer	8
8	RETAINER, Pinion Oil Seal	1
9	GASKET, Pinion Oil Seal Retainer	1
10	CONE, Outer Pinion Bearing	1
11	CUP, Outer Pinion Bearing	1
12	CAGE ASSEMBLY, Pinion Bearing	1
13	"O" RING, Outer Pinion Bearing Cage	1
14	SHIM, Bearing Cage	AR
15	SPACER, Pinion Bearing	1
16	CUP, Center Pinion Bearing	1
17	CONE, Center Pinion Bearing	1
18	HOUSING, Carrier	1
19	LOCK, Adjusting Nut	1
20	LOCKWASHER, Adjusting Nut Lock	1
21	BOLT, Adjusting Nut Lock	1
22	NUT, Differential Adjusting	1
23	CUP, Differential Bearing	1
24	CONE, Differential Bearing	1
25	NUT, Ring Gear	12
26	DIFFERENTIAL CASE – Flange Half	1
27	RING GEAR	1
28	BOLT, Ring Gear	12
29	WASHER, Side Gear Thrust	1
30	GEAR, Differential Side	1
31	WASHER, Differential Pinion Thrust	1
32	PINION, Differential	1
33	WASHER, Differential Pinion Thrust	1
34	PINION, Differential	1
35	SPIDER, Differential	1
36	GEAR, Differential Side	1
37	WASHER, Side Gear Thrust	1
38	DIFFERENTIAL CASE – Plain Half	1
39	BOLT, Differential Case	8
40	PINION, Differential	1
41	WASHER, Differential Pinion Thrust	1
42	PINION, Differential	1
43	WASHER, Differential Pinion Thrust	1
44	RING, Inner Bearing Retaining	1
45	BEARING, Inner Pinion	1
46	PINION	1
47	BOLT AND WASHER, Carrier Cap	4
48	CAP, Carrier	2
49	BOLT, Adjusting Nut Lock	1
50	LOCKWASHER, Adjusting Nut Lock	1
51	LOCK, Adjusting Nut	1
52	NUT, Differential Adjusting	1
53	CUP, Differential Bearing	1
54	CONE, Differential Bearing	1

AR - As Required

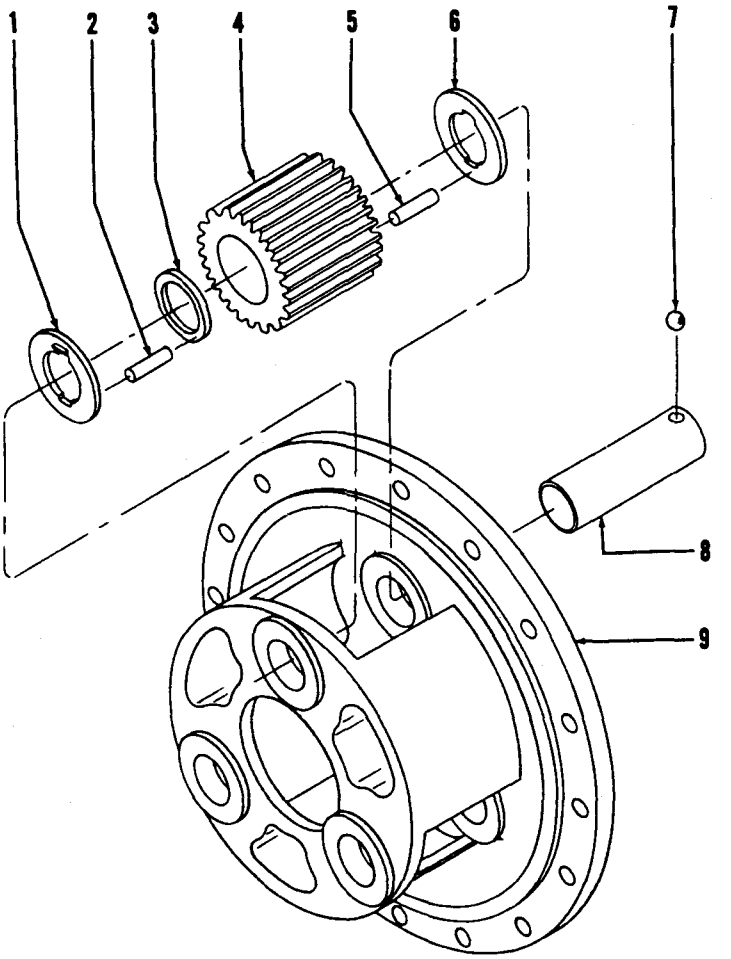


FIG. D

TS-460

PLANET CARRIER ASSEMBLY

Item No.	Description	No. Req'd.
1	WASHER, Pinion Thrust	3
2	ROLLER, Pinion	84
3	SPACER, Pinion Roller	3
4	PINION	3
5	ROLLER, Pinion	84
6	WASHER, Pinion Thrust	3
7	BALL, Pinion Shaft Lock	3
8	SHAFT, Pinion	3
9	CARRIER, Planet	1

OVERHAUL OF AXLE ASSEMBLY

The instructions contained herein cover the disassembly and reassembly of the axle assembly in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled.

CAUTION: Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

NOTE: Placing axles on steel horses facilitates disassembly and reassembly. Greater stability is gained by resting axle mounting pads on horses so that axles are inverted from normal operating positions. Unless indicated otherwise, photographs showing this overhaul procedure were taken with axle in inverted position.

DISASSEMBLY OF AXLE

1. Remove drain plugs from planetary housings and from differential housing to drain axle (Fig. 1).

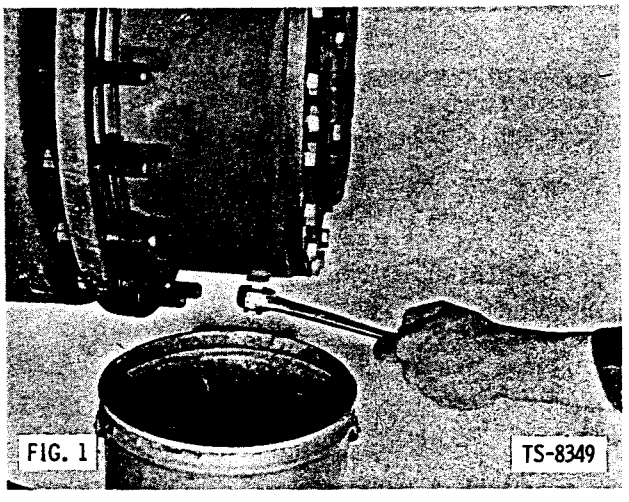


FIG. 1 TS-8349

2. Remove tie rod-to-support nuts and bolts and remove tie rod (Fig. 2).

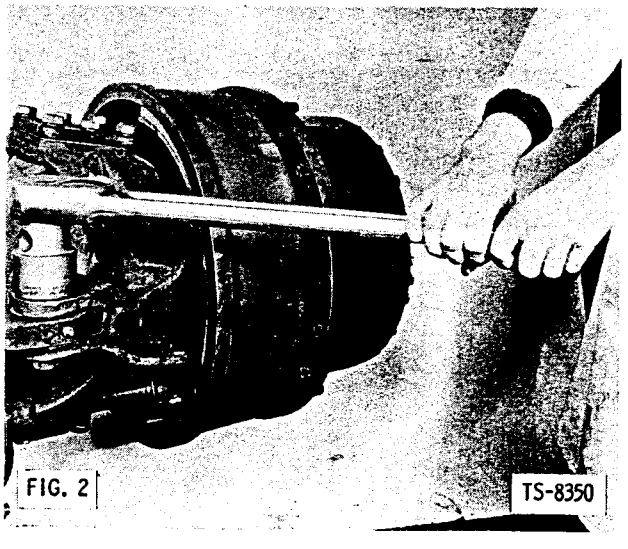


FIG. 2 TS-8350

3. If tie rod bushing is worn or damaged, press out bushing (Fig. 3).

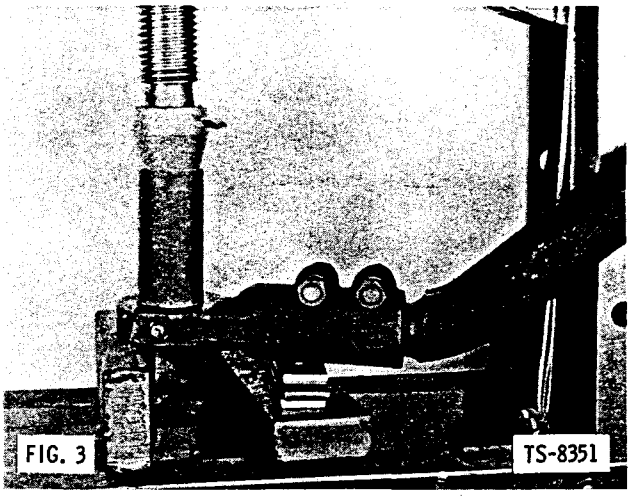


FIG. 3 TS-8351

4. Remove bolts and flat washers securing sun gear thrust cap (Fig. 4).

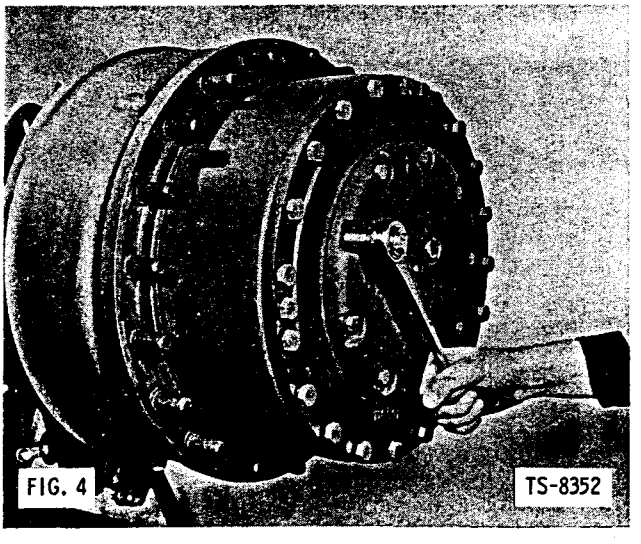


FIG. 4 TS-8352

5. Remove sun gear thrust cap (Fig. 5). Remove "O" ring from cap.

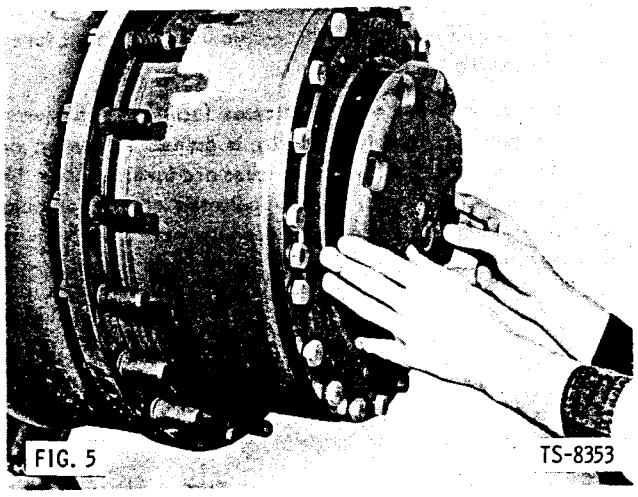


FIG. 5 TS-8353

6. Remove bolts and lockwashers retaining planet carrier (Fig. 6).

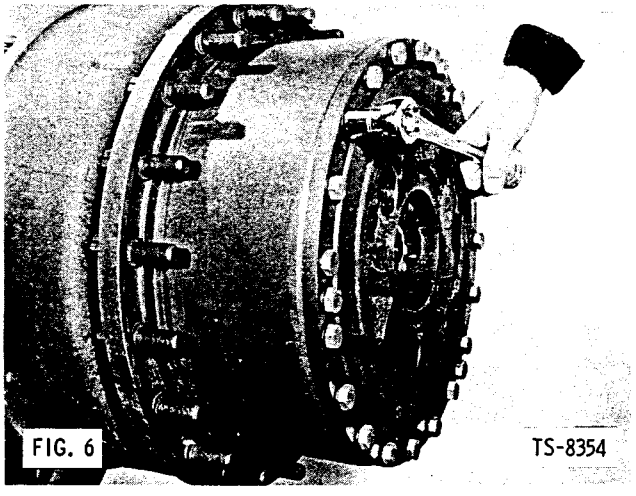


FIG. 6 TS-8354

7. Install three mounting bolts in puller holes to pull planet carrier from hub assembly (Fig. 7).

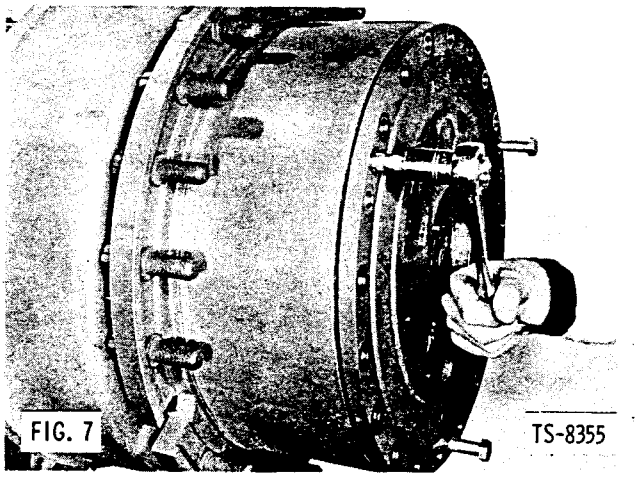


FIG. 7 TS-8355

8. Remove planetary assembly (Fig. 8). Remove "O" ring from planetary assembly.

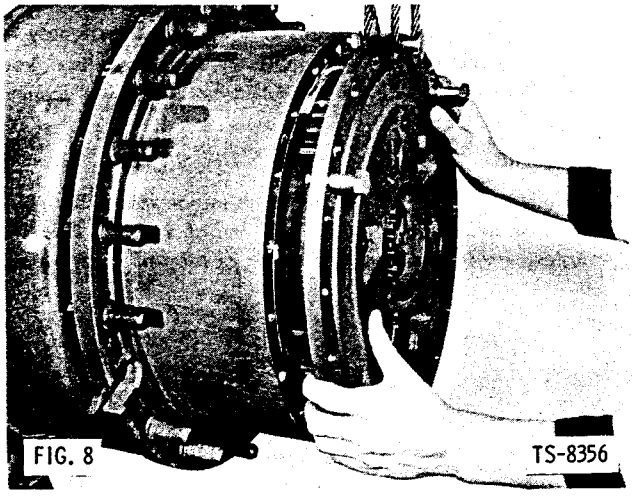


FIG. 8 TS-8356

9. Remove sun gear retaining ring (Fig. 9).

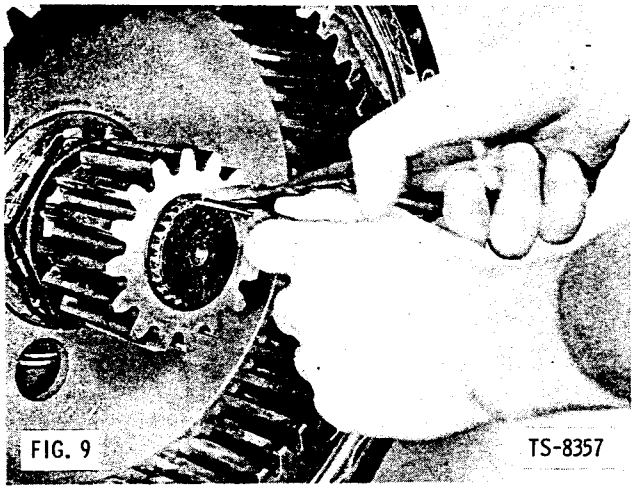


FIG. 9 TS-8357

10. Remove sun gear using suitable puller. Remove sun gear thrust ring (Fig. 10).

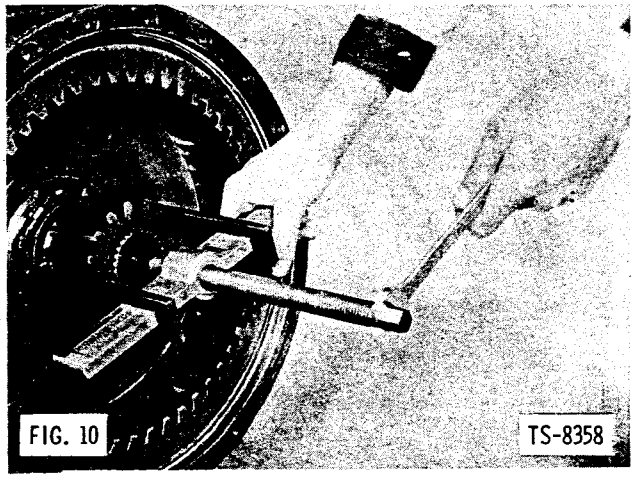


FIG. 10 TS-8358

11. Straighten tangs on nut lock as shown in Fig. 11.

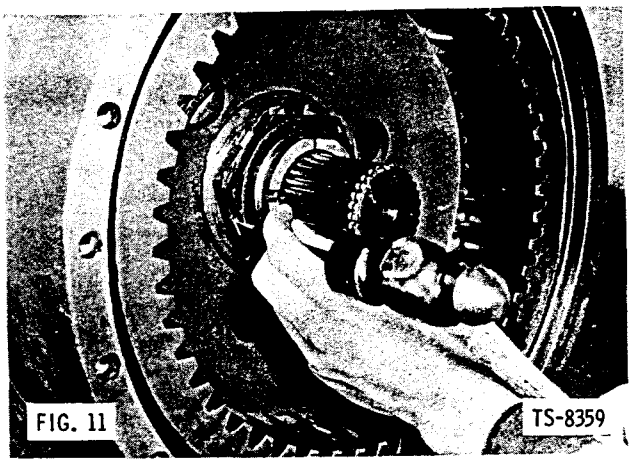


FIG. 11 TS-8359

12. Wrap several turns of .010- to .020-inch shim stock around end of axle shaft to protect shaft splines (Fig. 12). Install special wrench (Clark No. 945940) on outside spindle nut. Tighten guide screws lightly against shim stock.

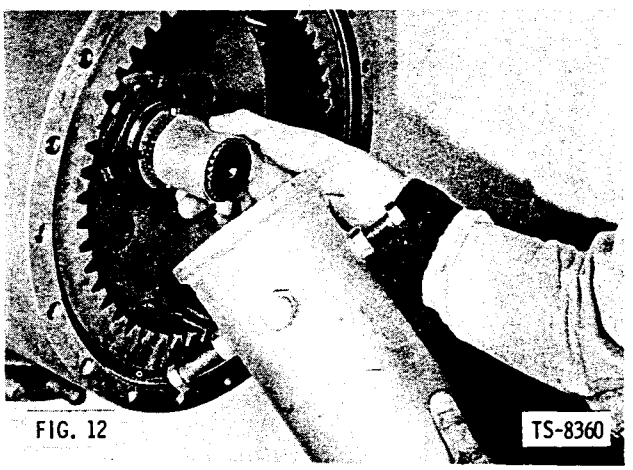


FIG. 12 TS-8360

13. Remove outside spindle nut, nut lock, and inside spindle nut (Fig. 13).

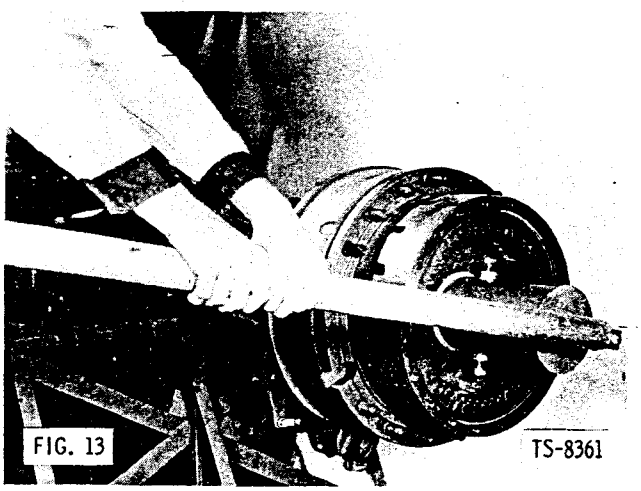


FIG. 13 TS-8361

14. Support weight of brake drum and hub assembly with hoist. Remove internal gear and hub from spindle assembly (Fig. 14). In some cases it will be necessary to use pry bars as shown.

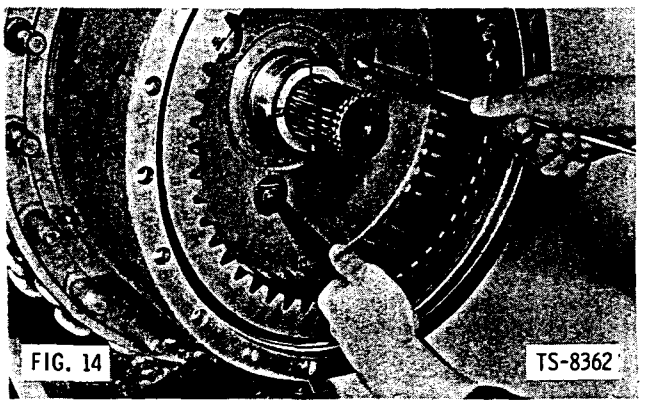


FIG. 14 TS-8362

15. Pull straight out on brake drum and hub assembly to remove it from axle (Fig. 15). Be sure brake shoes are in fully released position.

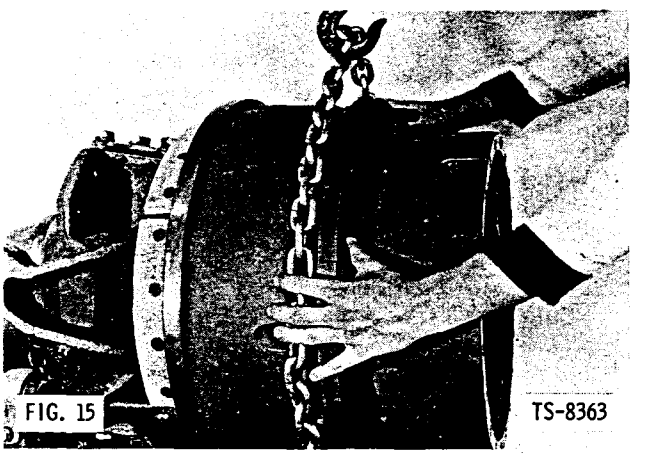


FIG. 15 TS-8363

16. Remove cotter pin and spring anchor pin washer. Disengage and remove brake shoe return spring (Fig. 16).

WARNING: If axle is being disassembled in a position inverted from that shown, support brake shoes or they will pivot around anchor pin when spring is released.

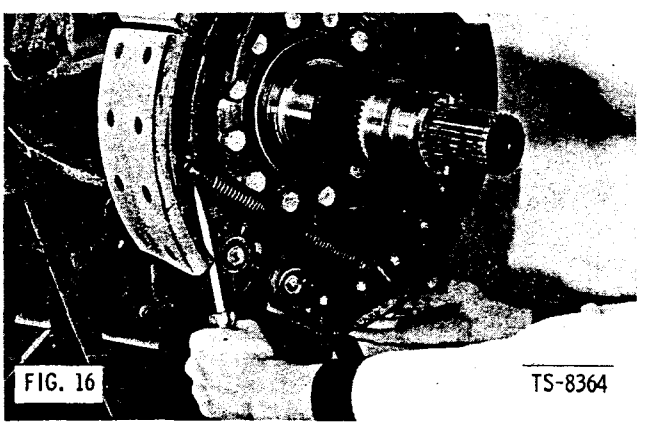


FIG. 16 TS-8364

17. Cut lockwire and remove anchor pin setscrews. Use pry bar under screw head to start anchor pin from spindle support assembly (Fig. 17).

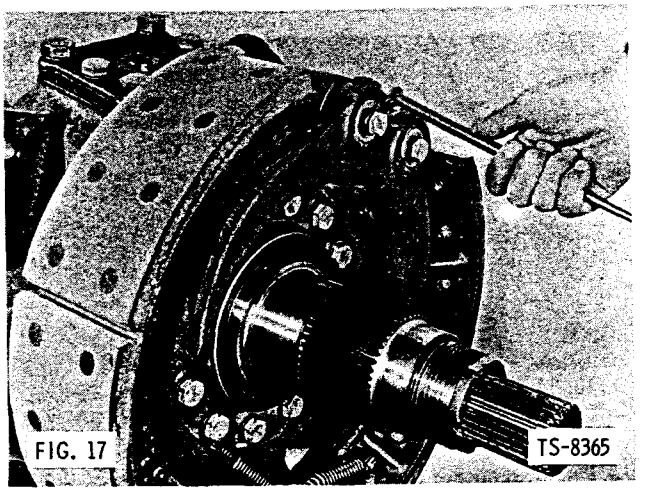


FIG. 17 TS-8365

18. Remove anchor pin and remove brake shoe (Fig. 18).

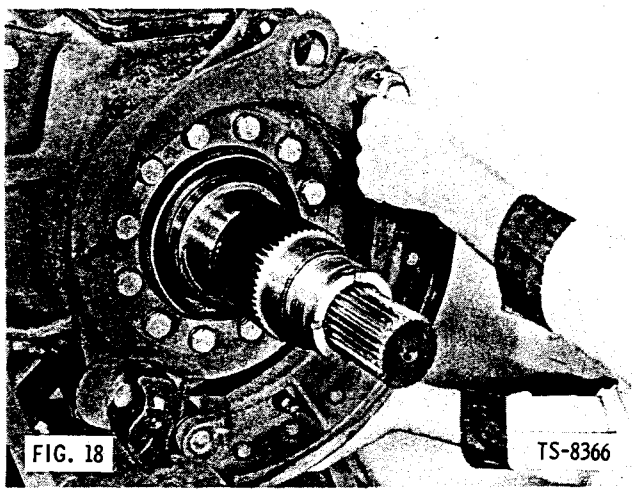


FIG. 18 TS-8366

19. Remove cotter pin and pin securing clevis of air brake chamber to slack adjuster. Remove nuts and lockwashers securing air chamber to air chamber bracket; remove air chamber (Fig. 19).

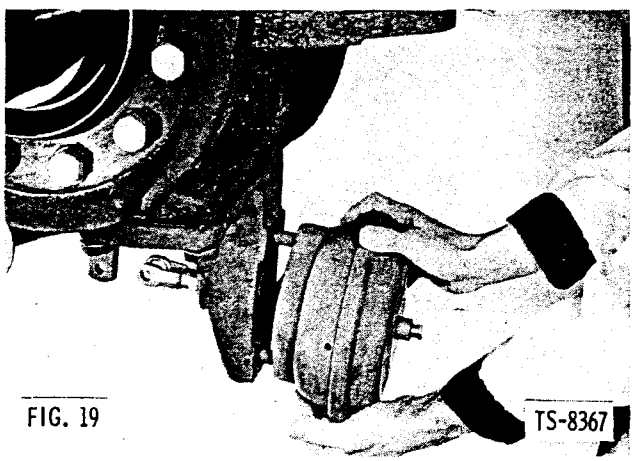


FIG. 19 TS-8367

20. Remove slack adjuster retaining ring (Fig. 20). Remove slack adjuster retaining washer.

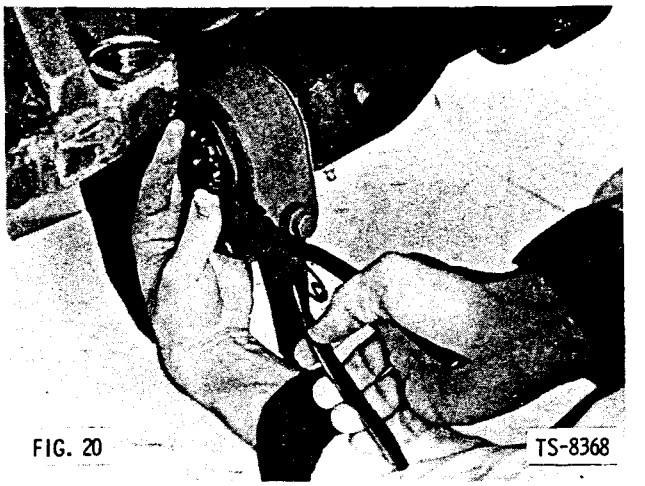


FIG. 20 TS-8368

21. Use plastic mallet to drive slack adjuster from brake camshaft (Fig. 21).

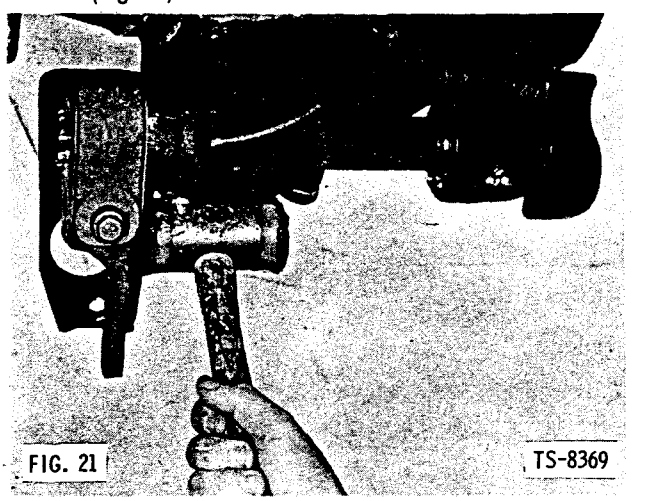


FIG. 21 TS-8369

22. Disengage second retaining ring securing brake camshaft to brake spider. Remove brake camshaft, retaining ring, retaining washer, grease retainer, "O" ring, thrust washer, and camshaft (Fig. 22).

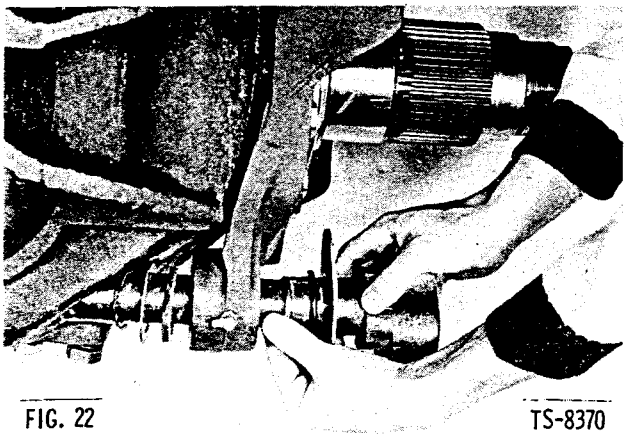


FIG. 22 TS-8370

23. If it is damaged, drive out brake spider bushing (Fig. 23).

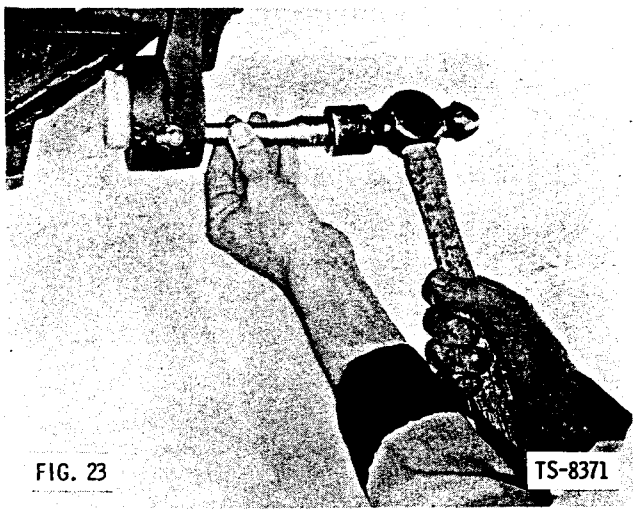


FIG. 23 TS-8371

24. Remove bolts and washers securing brake spider and spindle to spindle support (Fig. 24).

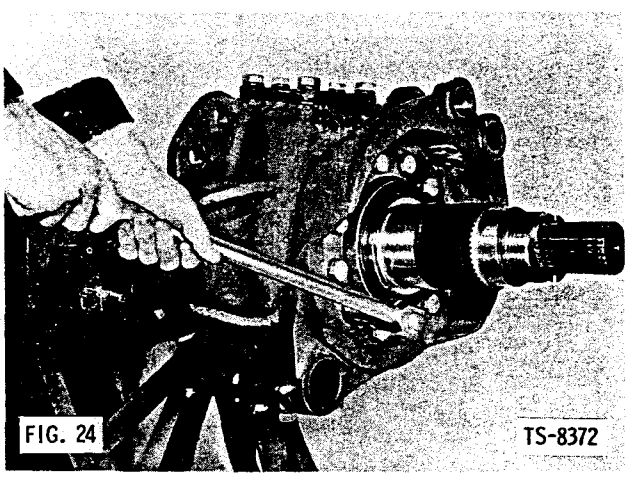


FIG. 24 TS-8372

25. Remove brake spider from spindle support (Fig. 25). Remove oil catcher which is released when spider is removed.

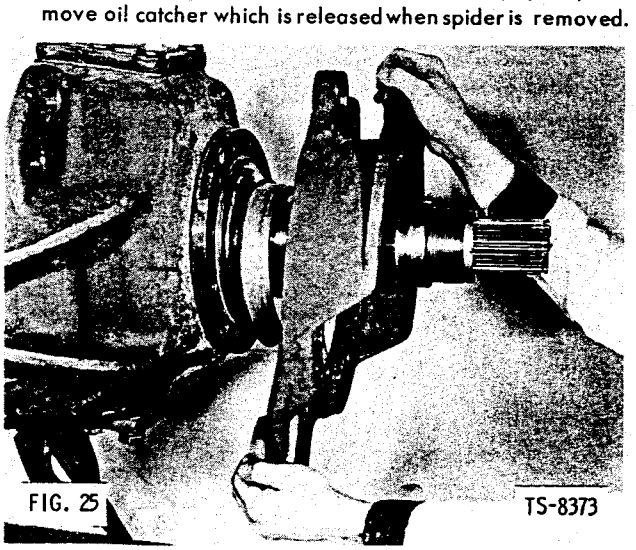


FIG. 25 TS-8373

26. Remove spindle from spindle support (Fig. 26).

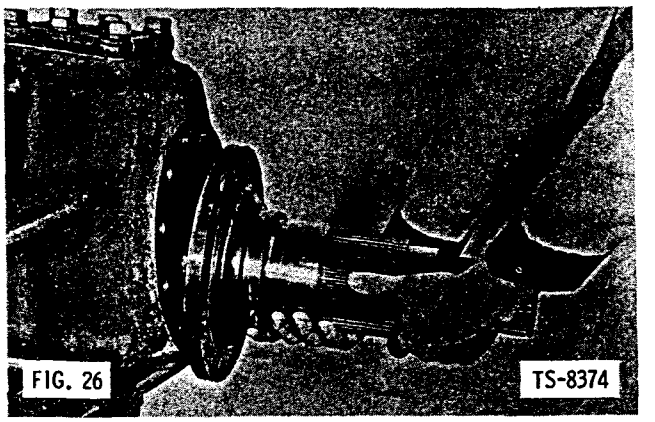


FIG. 26 TS-8374

27. Remove bolts securing air chamber bracket and steering trunnion to spindle support. Remove two puller hole bolts from air chamber bracket. Use two fully threaded 5/8-11 x 5-inch bolts or threaded rods in puller holes to pull air chamber bracket and trunnion from spindle support (Fig. 27). Remove bracket, trunnion, and shims.

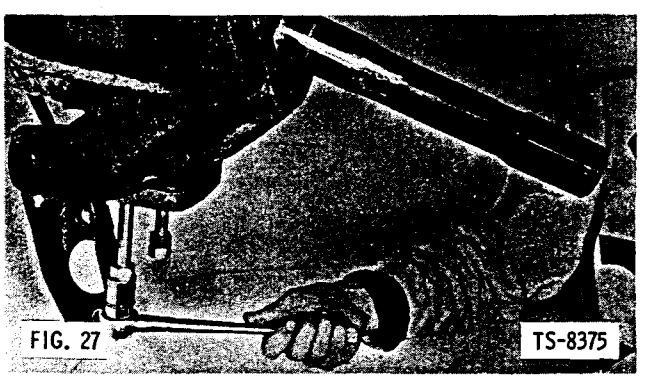


FIG. 27 TS-8375

28. Support weight of spindle support with hoist. Remove trunnion attaching bolts securing steering flanged trunnion to spindle support. Remove two puller hole bolts from flanged trunnion. Use two fully threaded 5/8-11 x 5-inch bolts or threaded rods in puller holes to pull flanged trunnion from spindle support (Fig. 28). Remove flanged trunnion and shims.

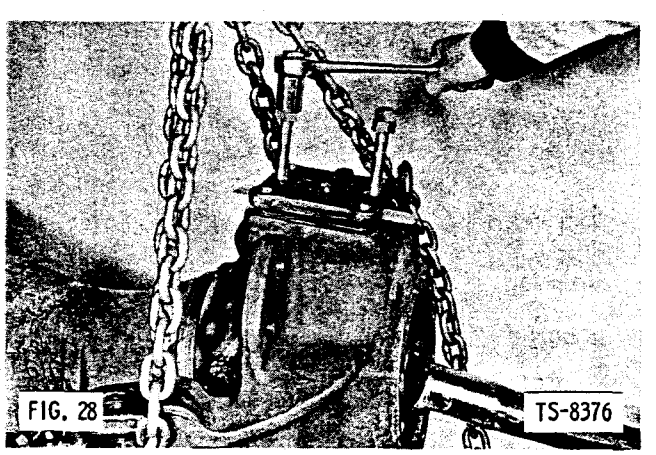


FIG. 28 TS-8376

29. Remove spindle support from axle housing (Fig. 29).

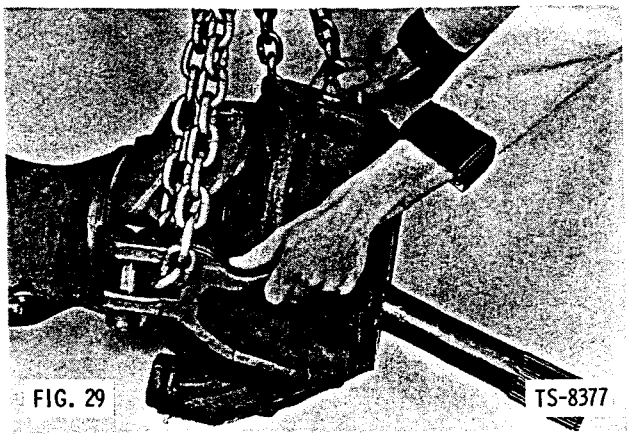


FIG. 29 TS-8377

30. Remove bolts securing U-joint to axle shaft (Fig. 30). Remove assembled U-joint and wheel end axle shaft.

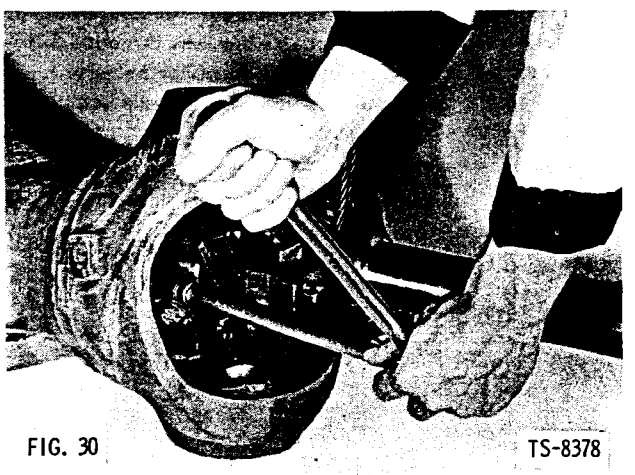


FIG. 30 TS-8378

31. Remove bolts and lockwashers securing axle shaft bearing retainer to axle housing (Fig. 31).

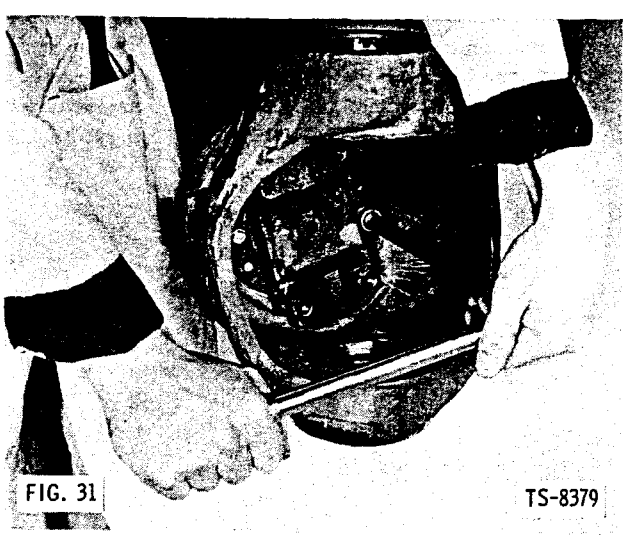


FIG. 31 TS-8379

32. Using an Allen key, remove the two setscrews from flange of bearing retainer. Replace setscrews with two mounting bolts that were removed in previous step. Turn in bolts to pull axle shaft and assembled parts from axle housing (Fig. 32).

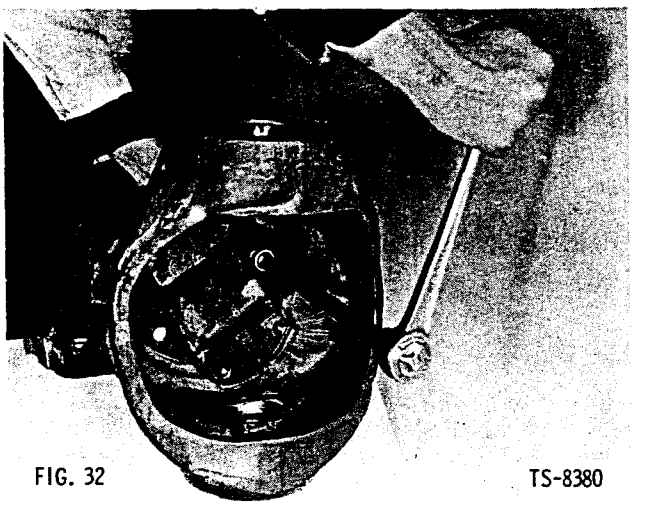


FIG. 32 TS-8380

33. Remove assembled differential end axle shaft, bearing, retainer, and seal from axle housing (Fig. 33).

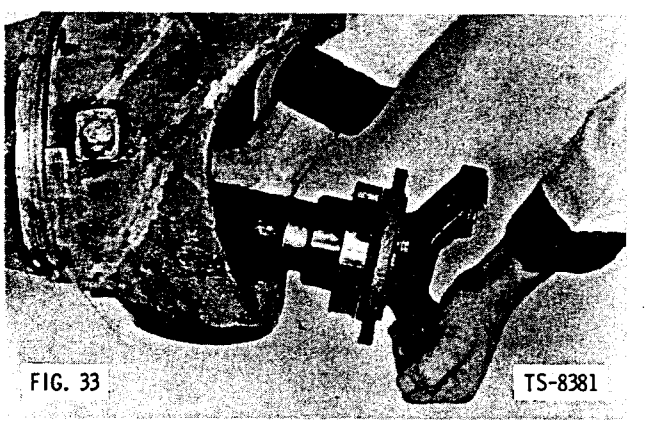


FIG. 33 TS-8381

34. Disassemble opposite side of axle following instructions given in steps 4 through 33.

35. Support weight of differential with hoist. Remove bolts, stud nuts, tapered dowels and washers securing differential carrier to axle housing (Fig. 34).

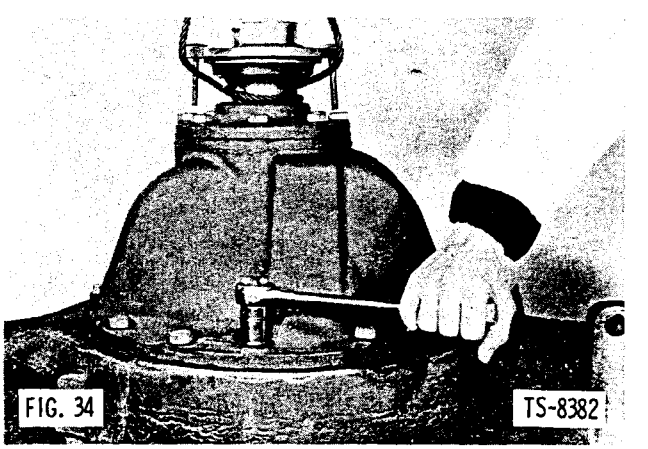


FIG. 34 TS-8382

36. Carefully hoist differential from housing (Fig. 35). It may be necessary to tap housing with soft mallet to break seal.

NOTE: The spherical steering trunnion bearings on axle Part No. 190009 consist of two solid parts – a cone and cup. All other axles use conventional tapered roller bearings. Disassembly of the spherical trunnion bearings for axle Part No. 190009 is covered in steps 37 through 40 below. Disassembly of trunnion bearings for all other axles is covered in steps 41 through 44 below.

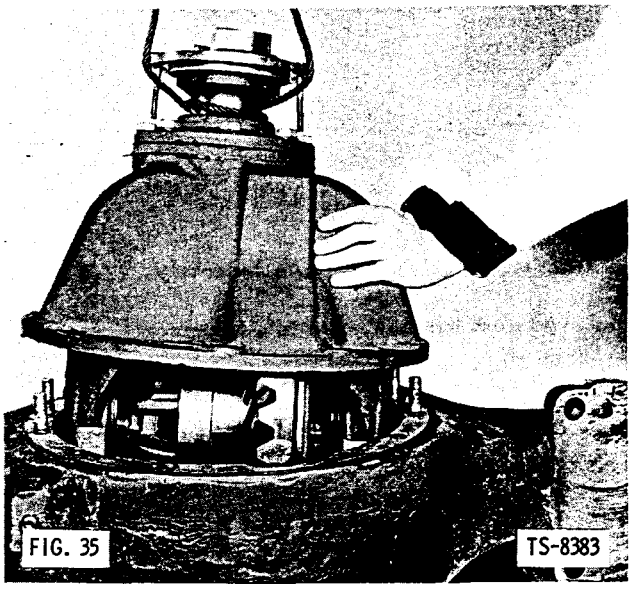


FIG. 35 TS-8383

37. Improvise a puller to remove damaged bearing cups from housing (Fig. 36). Take care to prevent damage to bearing bore.

NOTE: Bearing cups and cones must be replaced as a set. Do not attempt to replace the parts separately.

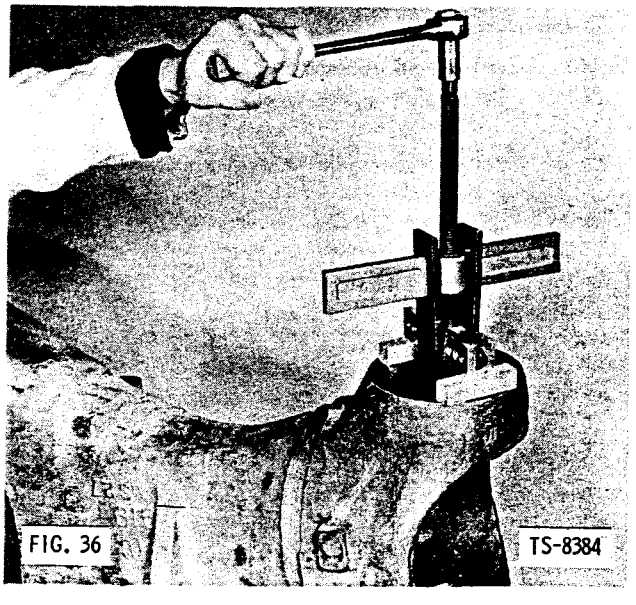


FIG. 36 TS-8384

38. If bearing cones on steering trunnions are damaged, use torch to heat cones until they expand enough to be pried off with screwdriver (Fig. 37).

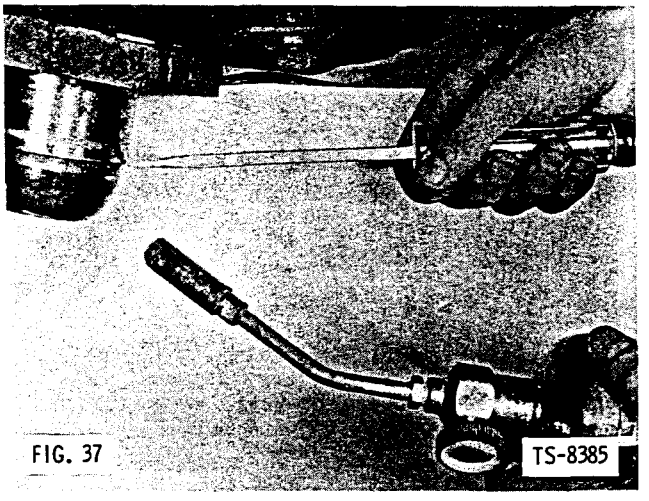


FIG. 37 TS-8385

39. If expansion plug in bearing bore is loose or leaking, pierce plug with punch and pry plug from bore (Fig. 38).

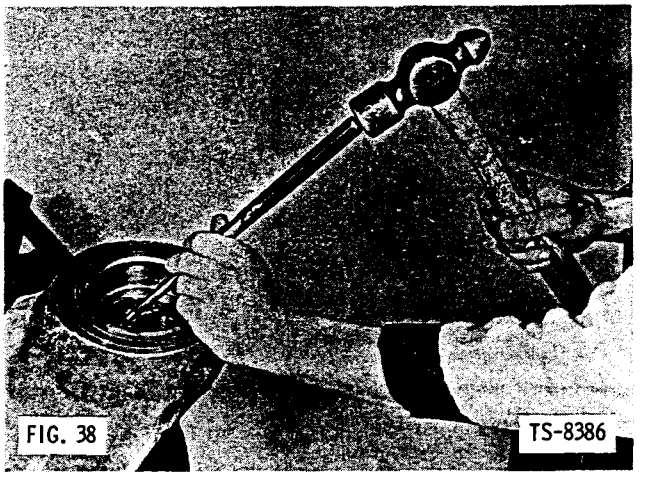


FIG. 38 TS-8386

40. Repeat steps 37 and 39 to remove opposite trunnion bearing.

41. Use pry bar to dislodge trunnion oil seal from trunnion bearing bore. Remove seal and trunnion bearing cone (Fig. 39).

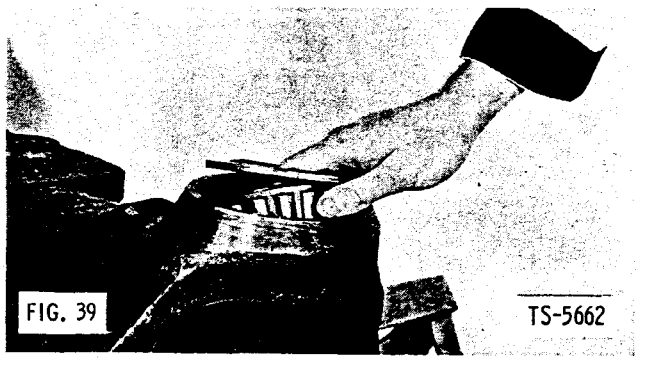


FIG. 39 TS-5662

42. If trunnion bearings cups require replacement, drive trunnion grease retainer out of bearing bore (Fig. 40).

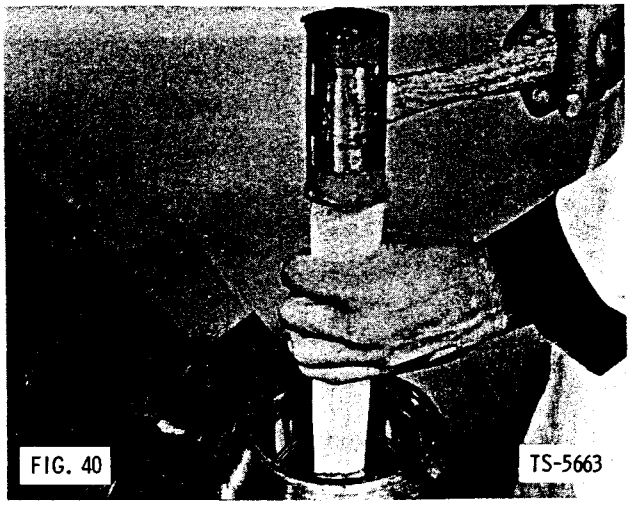


FIG. 40 TS-5663

43. Use soft drift or punch to drive damaged bearing cups from housing (Fig. 41). Take care to prevent damage to bearing bore.

FIG. 41 TS-5664

44. Repeat steps 41 through 43 to remove opposite trunnion bearing.

Disassembly of Planet Carrier Assembly

1. Place planet carrier assembly in press as shown and press out pinion shaft (Fig. 42). Take care to catch pinion shaft lock ball released as shaft is pressed out.

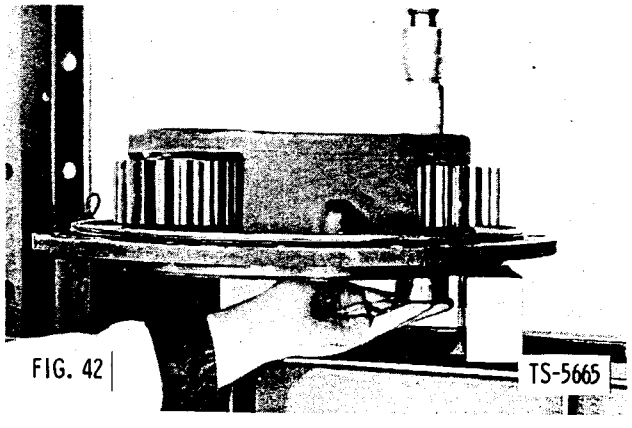


FIG. 42 TS-5665

2. Carefully remove pinion shaft, planet pinion, pinion thrust washers, pinion rollers, and pinion roller spacer (Fig. 43). Rollers will drop from pinions. Take care to prevent losing them.

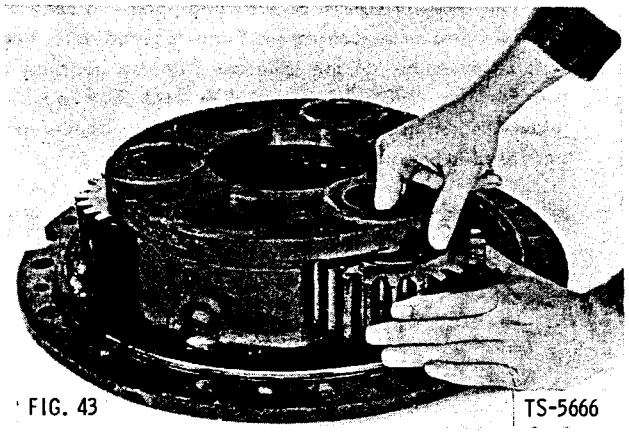


FIG. 43 TS-5666

Disassembly of Hub and Drum Assembly

1. Matchmark hub and drum to insure proper reassembly (Fig. 44).

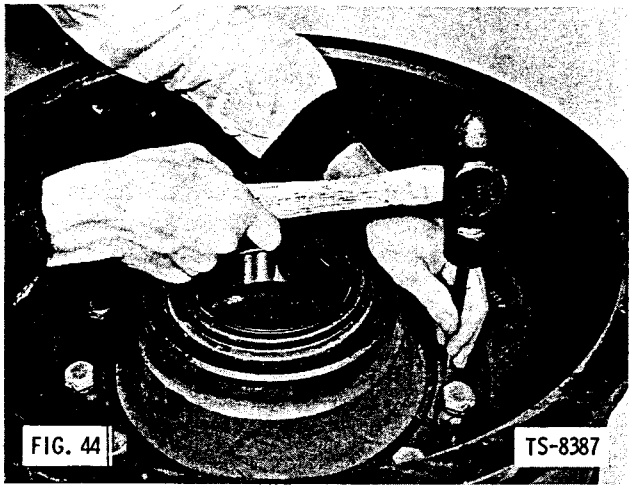


FIG. 44 TS-8387

2. Cut lockwires and remove bolts and washers securing brake drum to hub (Fig. 45). Remove brake drum.

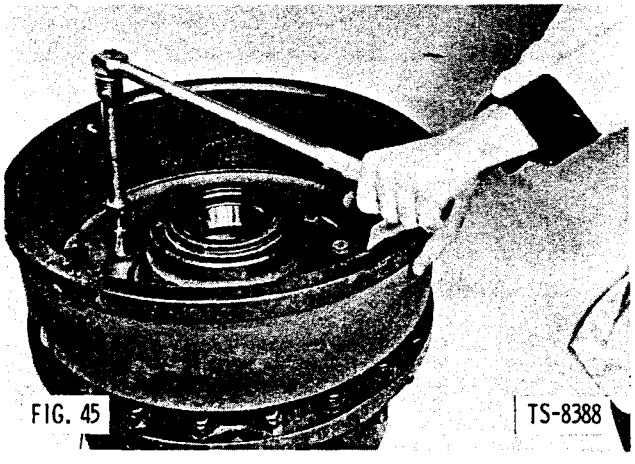


FIG. 45 TS-8388

3. Pry out oil seal (Fig. 46).

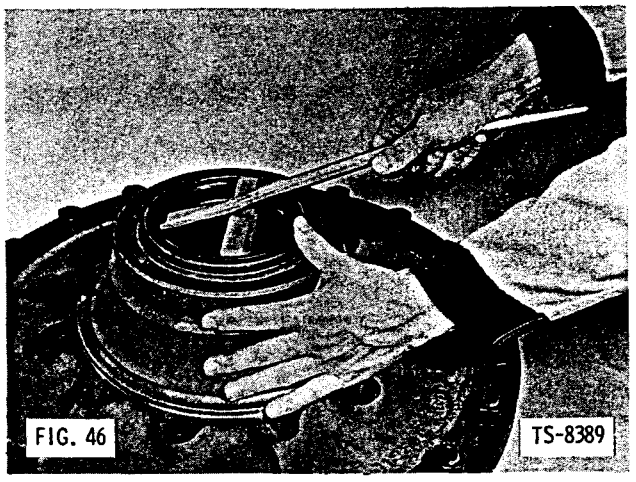


FIG. 46 TS-8389

4. Lift out bearing cone (Fig. 47).

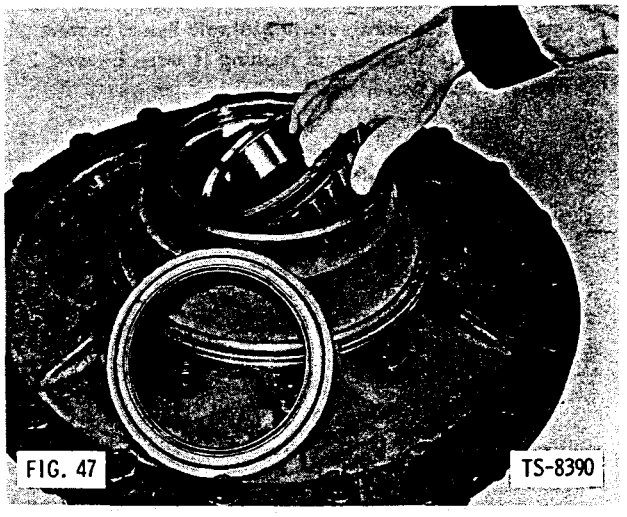


FIG. 47 TS-8390

5. If replacement of the bearing cups is required, drive out cups with a soft drift (Fig. 48). Exercise care to prevent damage to the bearing bores when driving out cups.

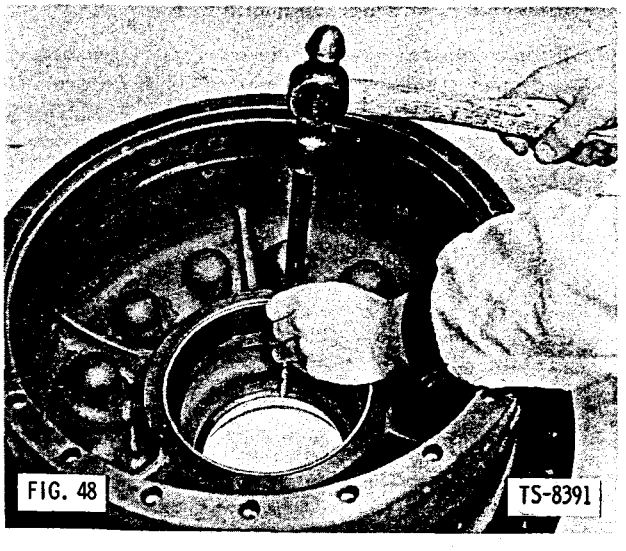


FIG. 48 TS-8391

6. If any wheel studs are damaged, all must be replaced. Remove self-locking nuts that secure wheel studs to hub. Drive out studs (Fig. 49).

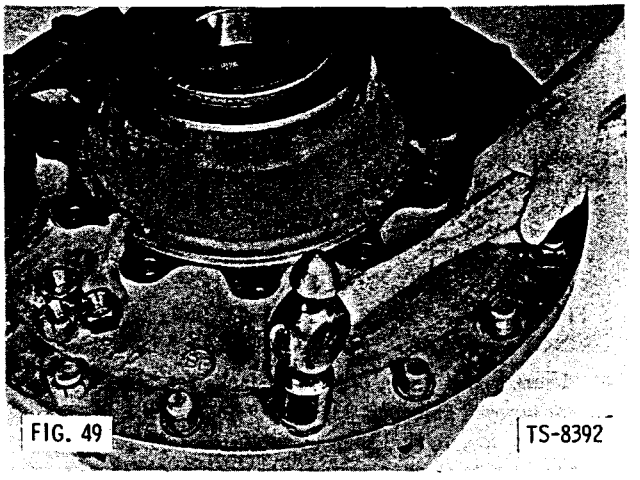


FIG. 49 TS-8392

Disassembly of Brake Assembly

1. If worn or damaged, press brake shoe bushing from brake shoe (Fig. 50). If inside diameter of bushing exceeds 1.513 inches, it should be replaced.

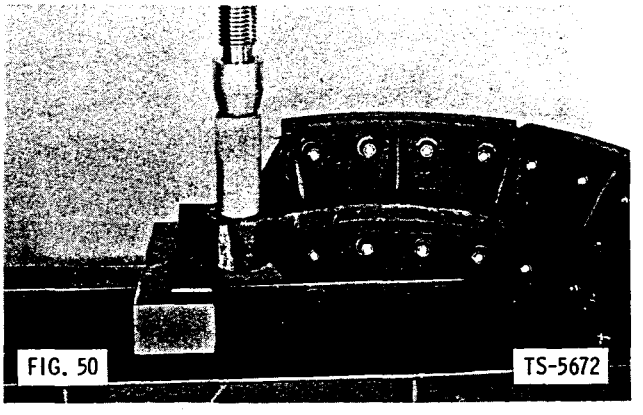


FIG. 50 TS-5672

2. Remove cotter pin and drive out cam roller pin lock pin with punch (Fig. 51).

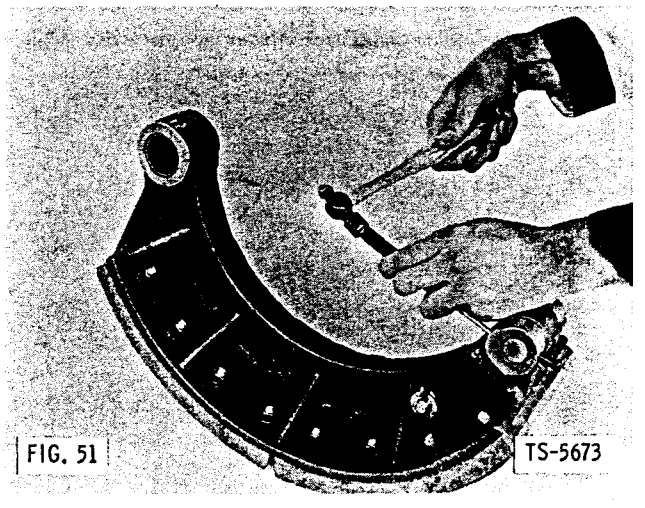


FIG. 51 TS-5673

3. Drive out cam roller pin (Fig. 52). Remove roller.

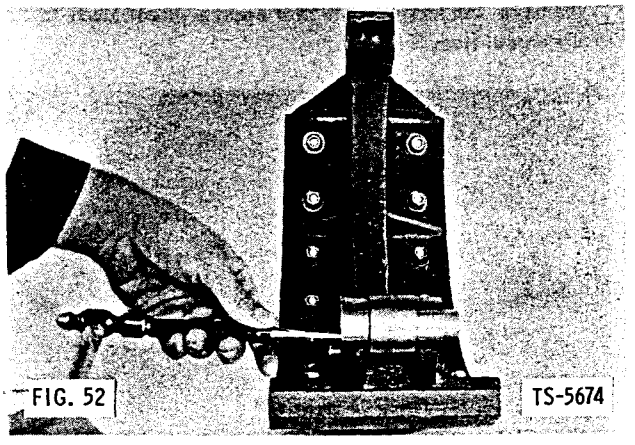


FIG. 52 TS-5674

4. Check brake lining for oil or grease saturation, wear, and looseness. If loose, tighten retaining bolts to 200 - 220 in.-lbs. torque. If saturated with grease, replace all lining blocks. If brake linings are worn to within 1/16 inch of bolt heads, replace linings. To remove linings, remove nuts, lockwashers, and bolts retaining lining to shoes (Fig. 53).

   NOTE: When replacing brake linings, all linings on both sides of axle assembly should be replaced at the same time.

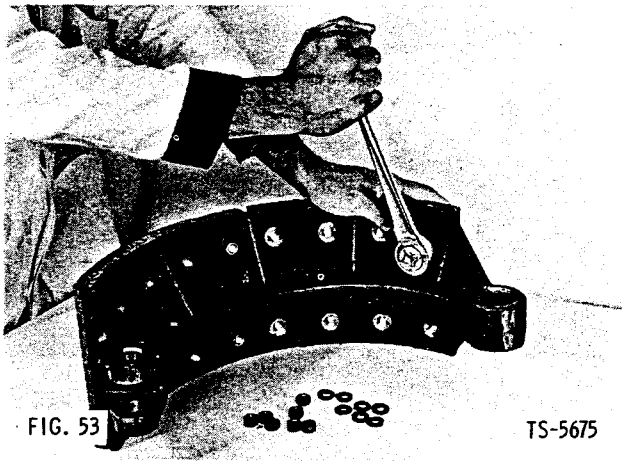


FIG. 53 TS-5675

Disassembly of Spindle Assembly

1. Pry out wheel shaft oil seal washer using pry bar (Fig. 54).

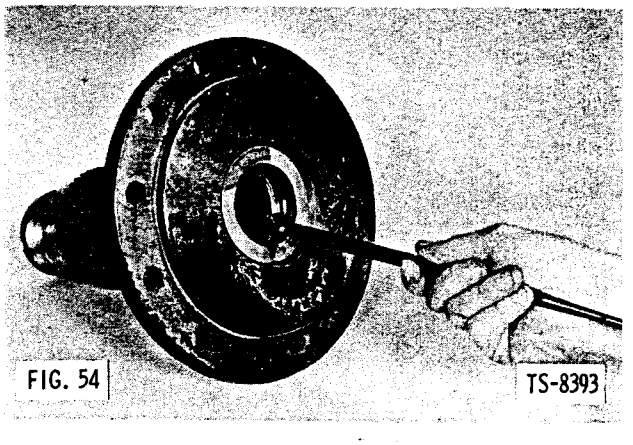


FIG. 54 TS-8393

2. Pry out wheel shaft oil seal using pry bar (Fig. 55).

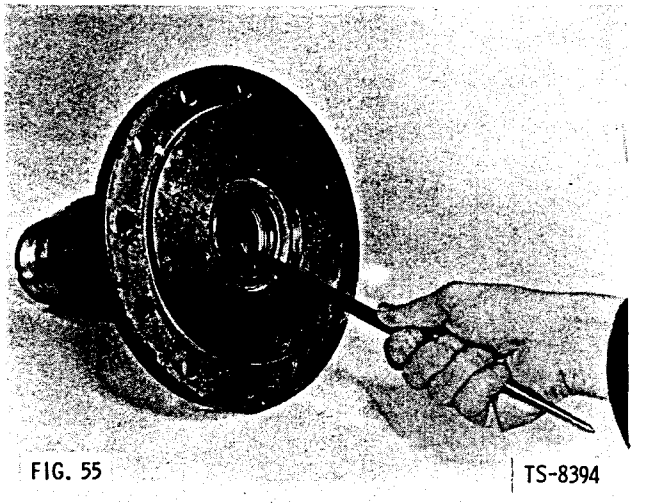


FIG. 55 TS-8394

3. Use chisel and hammer to remove spindle bushing, if it requires replacement, starting at split line of bushing (Fig. 56). If inside diameter of bushing is worn beyond 2.410 inches, it must be replaced.

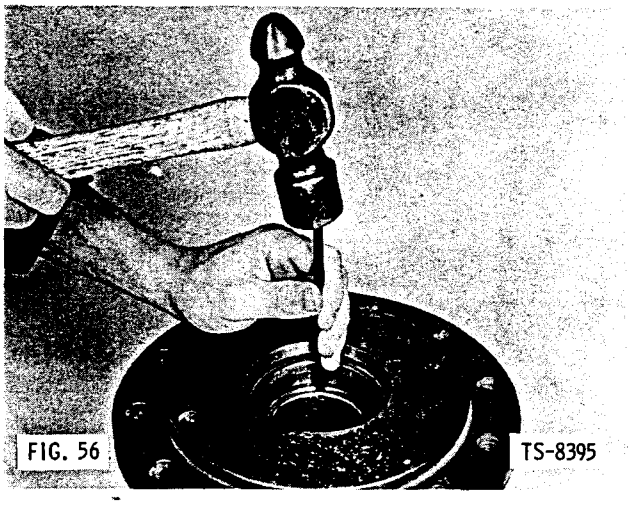


FIG. 56 TS-8395

Disassembly of Internal Gear and Hub

1. If replacement of internal gear is necessary, cut lockwires, and remove bolts, lockwashers, and hub-to-gear retaining plates securing hub to gear. Lift hub from gear (Fig. 57).

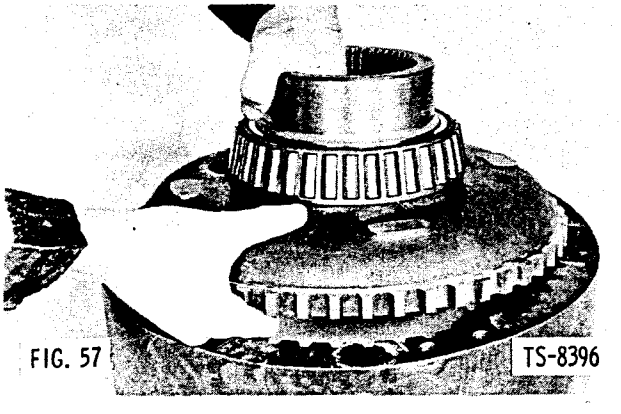


FIG. 57 TS-8396

2. If bearing cone is damaged, drive cone from hub (Fig. 58).

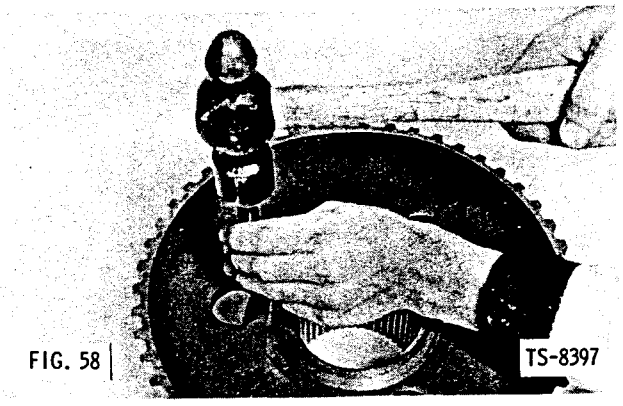


FIG. 58 TS-8397

Disassembly of U-Joint and Axle Shaft

1. Remove bolts securing U-joint to wheel end axle shaft; remove axle shaft (Fig. 59). Insert pry bar through axle shaft parts to prevent it from turning while removing bolts.

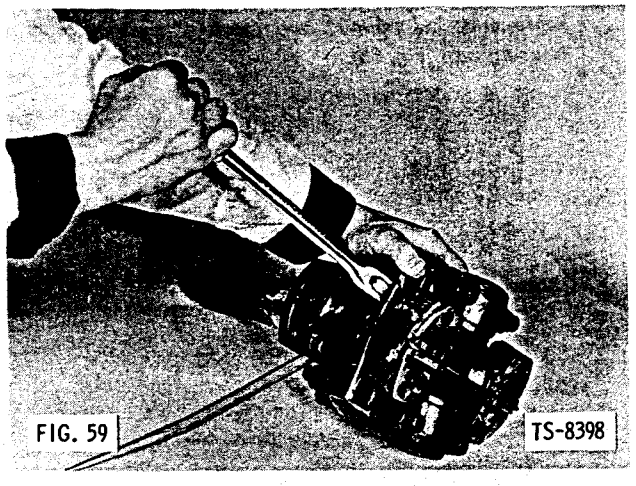


FIG. 59 TS-8398

2. Remove bolts securing spider and bearing assemblies to U-joint coupling plate; remove spider and bearing assemblies (Fig. 60).

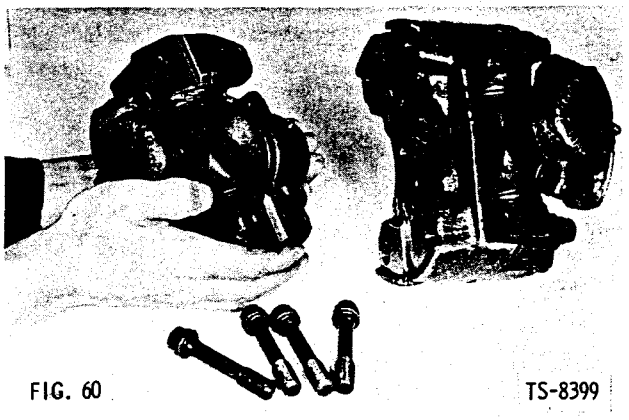


FIG. 60 TS-8399

3. Remove bearing caps far enough to inspect spider arm for scoring or galling (Fig. 61). Replace entire spider and bearing assembly if bearing surfaces are damaged.

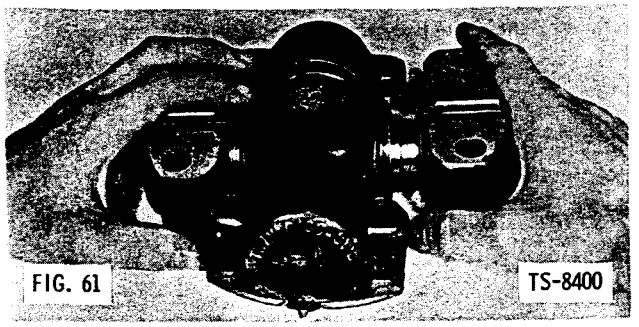


FIG. 61 TS-8400

4. If axle shaft bearing or seal requires replacement, it is necessary to remove bearing retainer collar. If bearing is going to be reused (see NOTE below), cover bearing with masking tape to prevent entrance of foreign material. Drill 1/4-inch-diameter hole at approximately 45-degree angle at point shown in Fig. 62. Drill three 1/8-inch-diameter holes in line with first hole. Do not drill into axle shaft. Do not heat collar to remove. Heating can damage axle shaft.

   NOTE: Reuse of bearing is not recommended on any unit with appreciable hours of service, since labor cost to replace bearing at later time is considerable.

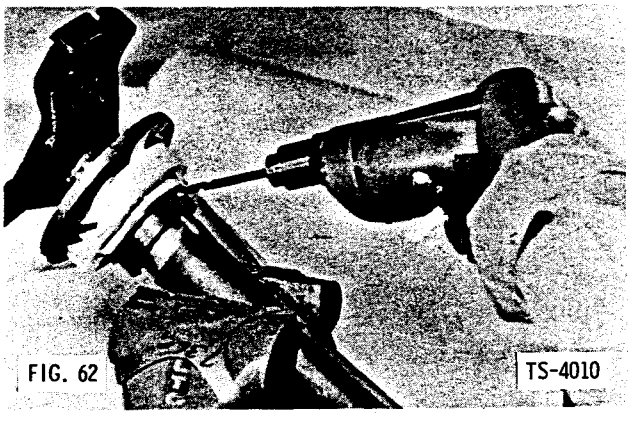


FIG. 62 TS-4010

5. Use hammer and chisel to split collar (Fig. 63). Remove collar, bearing, and assembled bearing retainer and oil seal.

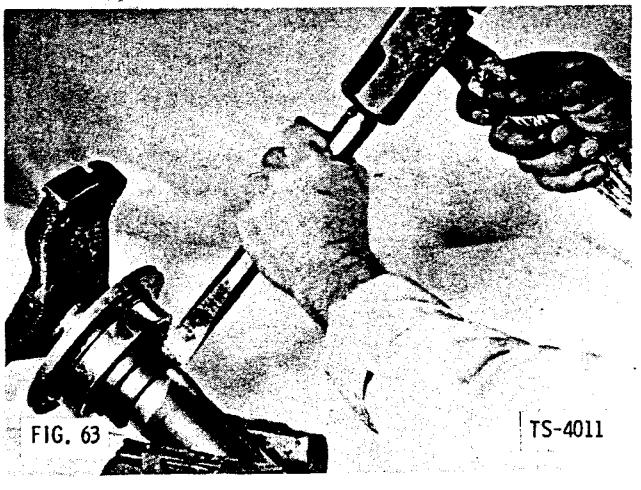


FIG. 63 TS-4011

6. Pry seal from bearing retainer (Fig. 64).

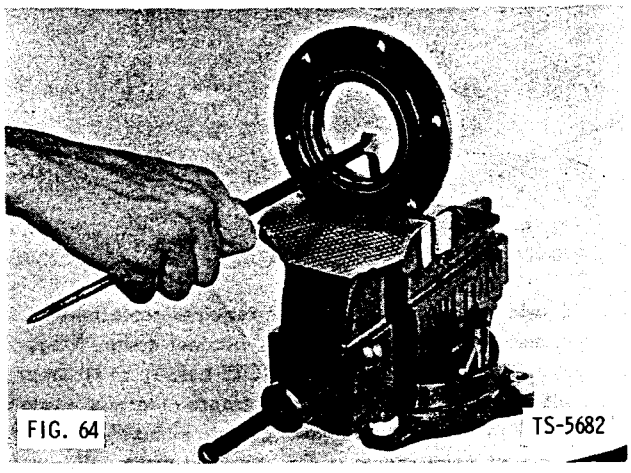


FIG. 64 TS-5682

Disassembly of Differential

1. Mount differential on a differential overhaul stand. Check and record ring gear backlash with a dial indicator. This information is necessary for reassembly unless a new gear set is installed (Fig. 65).

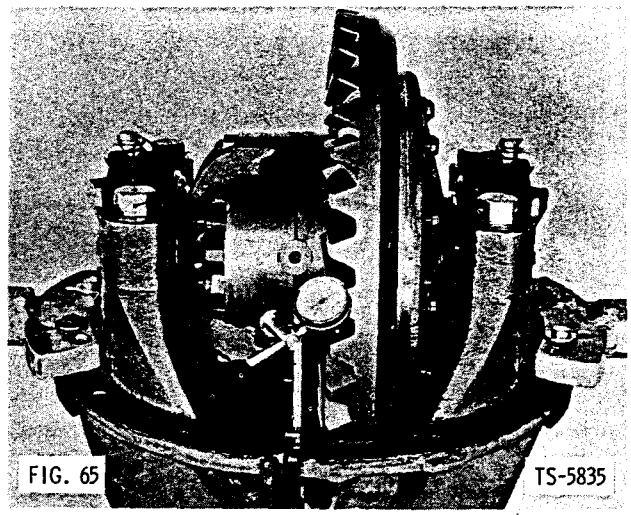


FIG. 65 TS-5835

2. Use center punch to matchmark bearing caps to carrier assembly. This is to insure correct match in reassembly (Fig. 66).

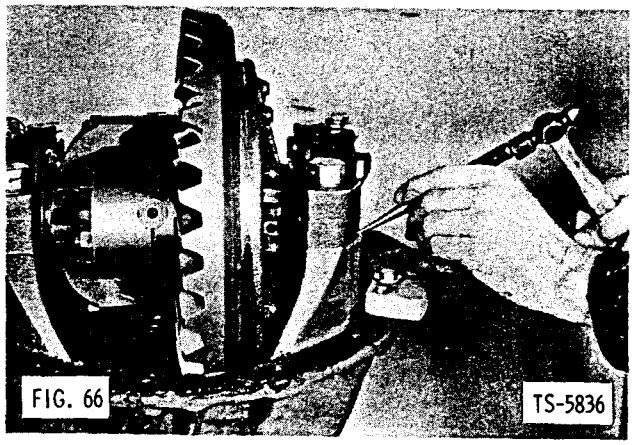


FIG. 66 TS-5836

3. Remove lockwire and adjusting nut locks. Remove bearing cap bolts and bearing caps (Fig. 67).

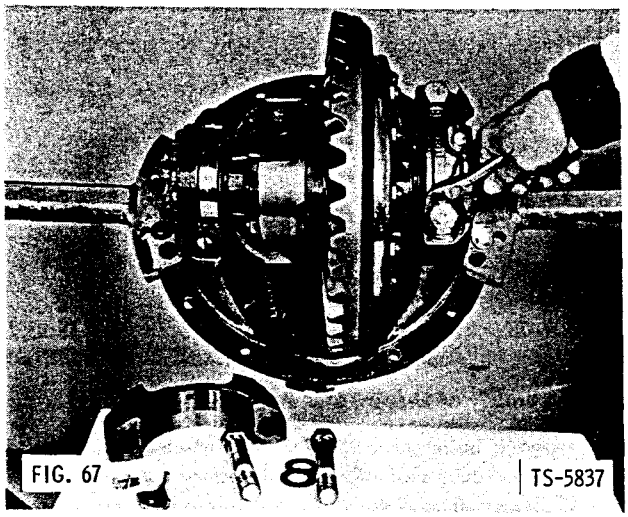


FIG. 67 TS-5837

4. Insert metal bar through differential to facilitate hoisting. Raise ends individually and remove adjusting nuts and bearing cups (Fig. 68).

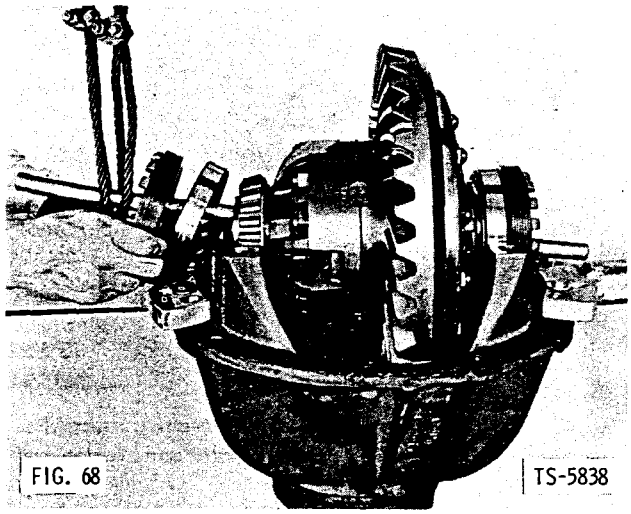


FIG. 68 TS-5838

5. Hoist differential from carrier assembly (Fig. 69).

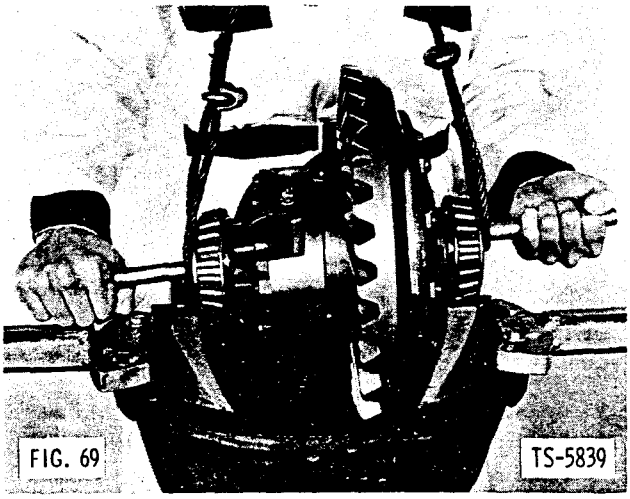


FIG. 69 TS-5839

6. On axle Part Nos. 131508 and 190009, because of the design of the companion flange, walls of standard 2-5/8-inch sockets are too thick to permit removal of pinion shaft nut. Grind or turn standard socket to dimensions shown in Fig. 70.

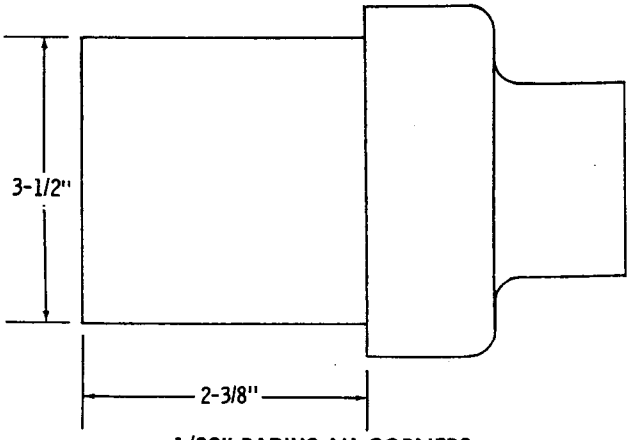


FIG. 70 1/32" RADIUS ALL CORNERS TS-8401

7. Remove cotter pin securing pinion shaft nut to pinion shaft. Position socket on pinion shaft nut, and then install flange retainer tool on flange, inserting two spacers between tool and flange (Fig. 71). Spacer dimensions are given in Fig. 72.

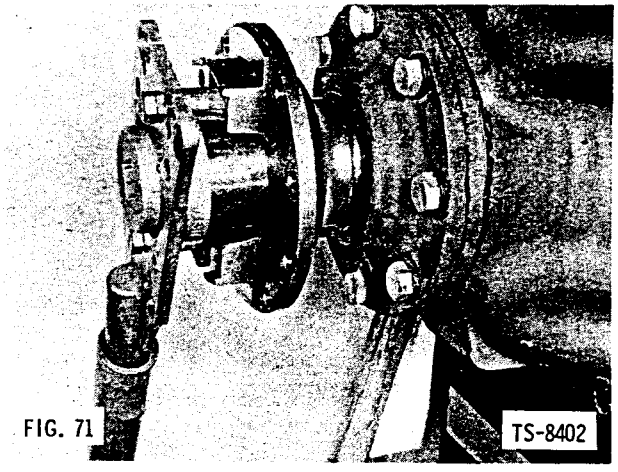


FIG. 71 TS-8402

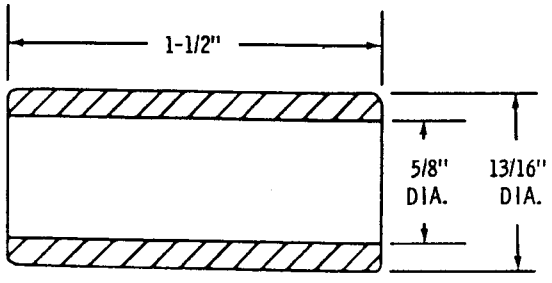


FIG. 72 1/32" RADIUS ALL CORNERS TS-8403

8. Remove shaft nut as shown in Fig. 73. Remove washer.

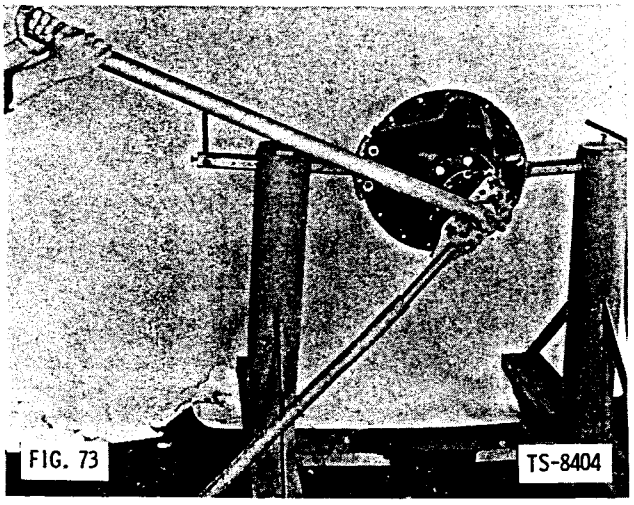


FIG. 73 TS-8404

9. Remove companion flange from pinion shaft with puller (Fig. 74).

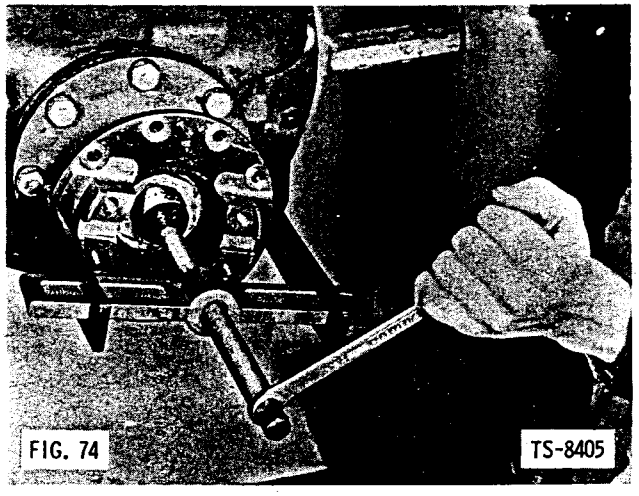


FIG. 74 TS-8405

10. Remove bolts securing seal retainer to carrier and remove retainer (Fig. 75). If necessary, tap with soft mallet to break seal between parts.

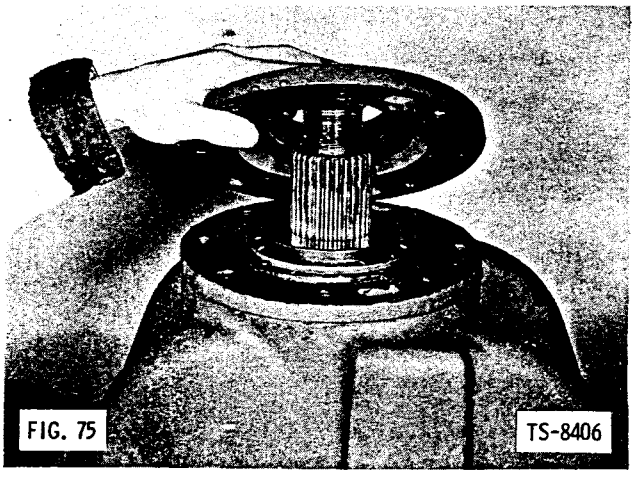


FIG. 75 TS-8406

11. Drive pinion oil seal from pinion oil seal retainer (Fig. 76).

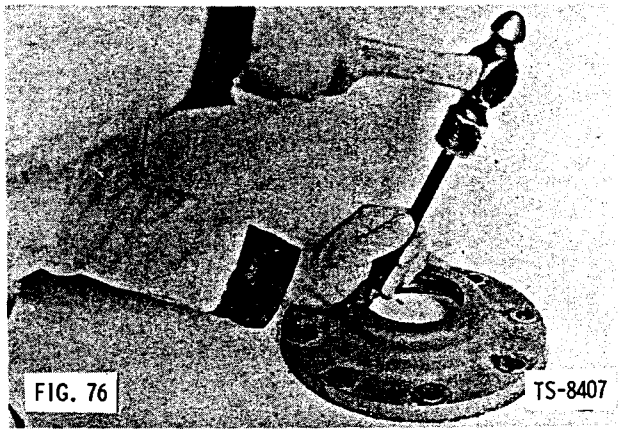


FIG. 76 TS-8407

12. Screw two bolts (1/2-13 threads) in puller holes and pull bearing cage from carrier assembly (Fig. 77). This pulls outer pinion bearing cone from shaft. Turn each bolt equally to prevent damage to carrier, shaft, or bearings. After bearing cage is pulled out a short distance, back off puller screws and insert .030-inch shim stock under puller screws before pulling is continued, to reduce possible damage to shim pack under flange of bearing cage.

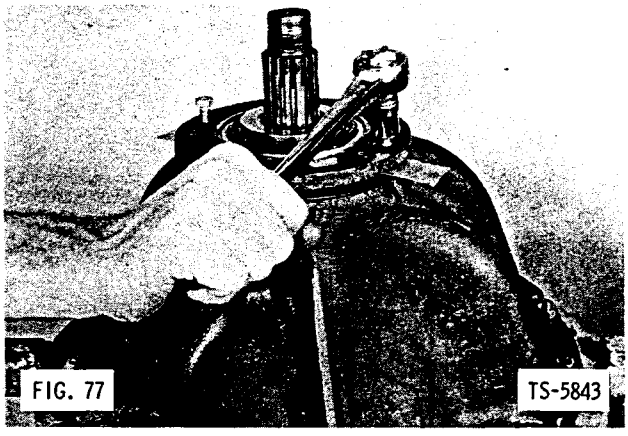


FIG. 77 TS-5843

13. Remove pinion shaft assembly from carrier (Fig. 78). Remove bearing cage shims. Retain bearing cage shim pack intact for possible reuse in reassembly.

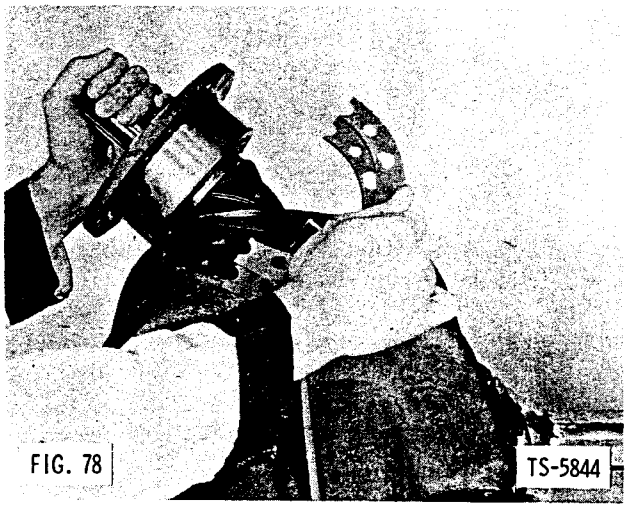


FIG. 78 TS-5844

Disassembly of Differential Case and Ring Gear

1. Matchmark case halves to insure correct reassembly (Fig. 79).

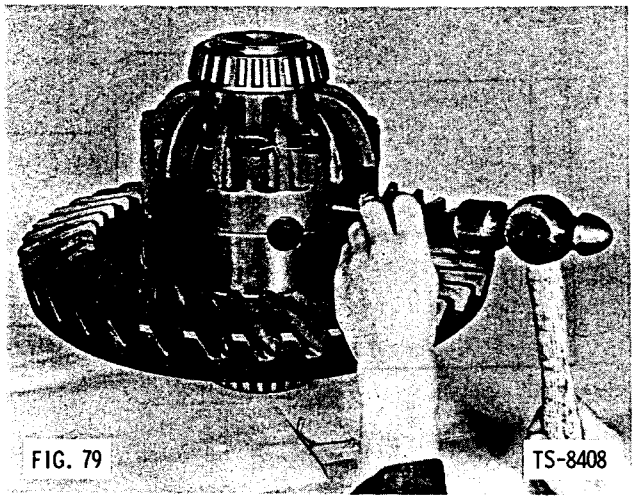


FIG. 79 TS-8408

2. Remove differential bolts securing together case halves. Lift off plain case half (Fig. 80). Use soft mallet if necessary to aid removal.

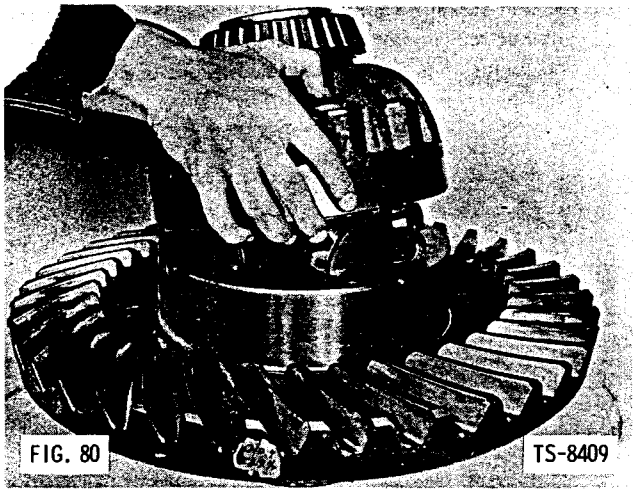


FIG. 80 TS-8409

3. Remove spider, pinions, and thrust washers (Fig. 81).

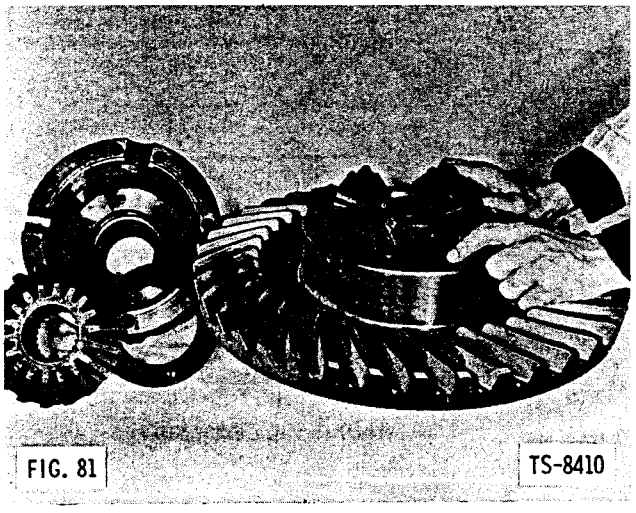


FIG. 81 TS-8410

4. Remove nuts and bolts; remove ring gear (Fig. 82).

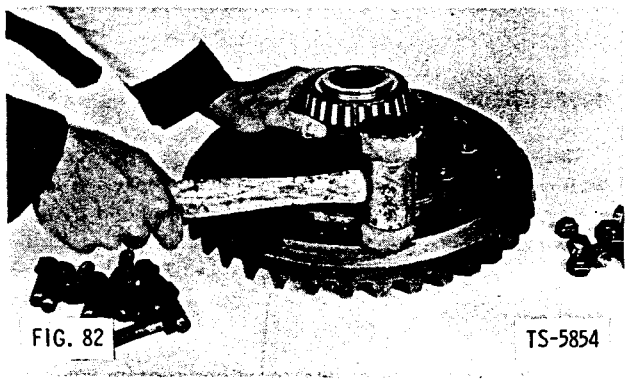


FIG. 82 TS-5854

5. If replacement is required, remove differential bearing cones with a suitable puller (Fig. 83).

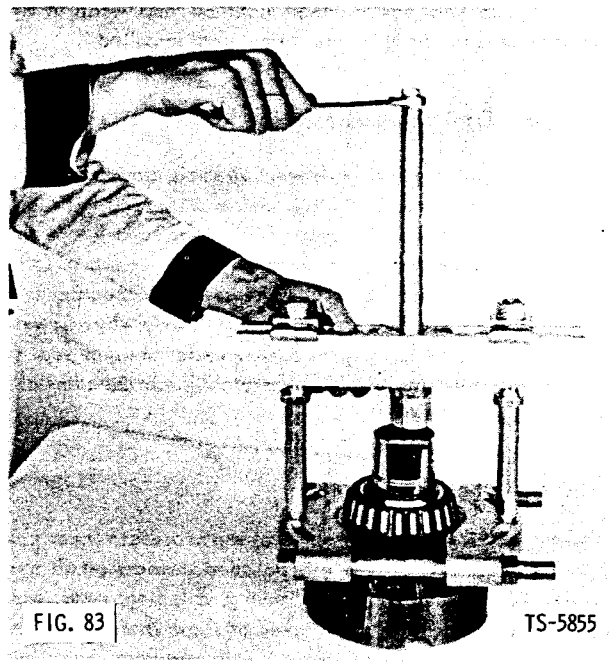


FIG. 83 TS-5855

Disassembly of Pinion Shaft Assembly

1. Press pinion shaft from pinion bearing cage assembly. This will release outer pinion bearing cone (Fig. 84).

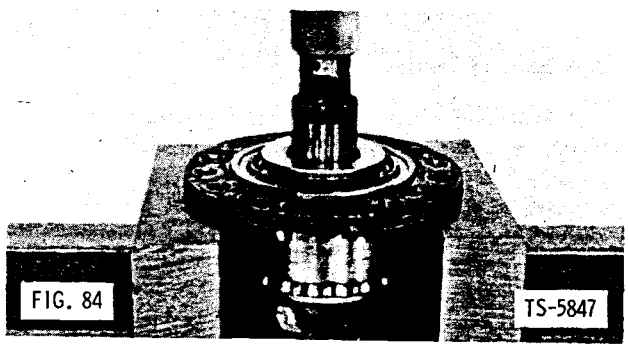


FIG. 84 TS-5847

2. Press center pinion bearing cone from pinion assembly (Fig. 85).

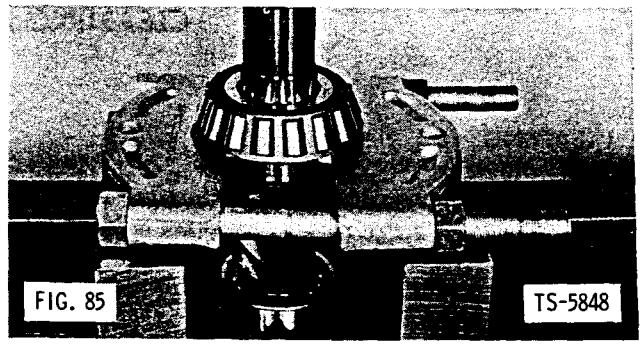


FIG. 85 TS-5848

3. Remove inner pinion bearing retaining ring (Fig. 86).

NOTE: Some axles in this series have inner pinion bearing staked to pinion shaft, replacing retaining ring feature. Remove staking before pressing bearing from pinion assembly.

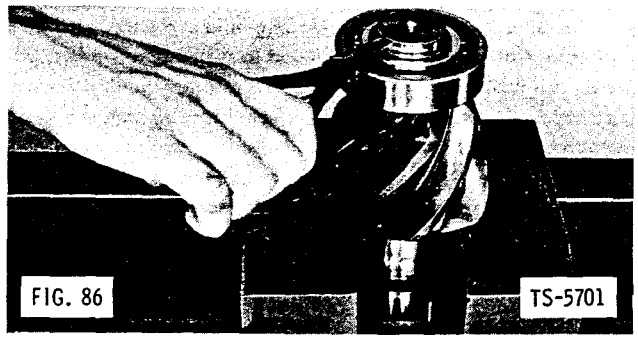


FIG. 86 TS-5701

4. Press inner bearing from pinion assembly (Fig. 87).

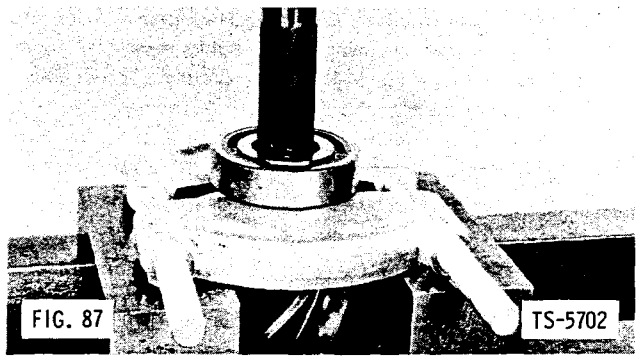


FIG. 87 TS-5702

5. If worn or damaged, drive bearing cups from pinion bearing cage (Fig. 88).

FIG. 88 TS-5850

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent-type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and slushed up and down slowly until all old lubricant and foreign material are dissolved and parts are thoroughly cleaned.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent-type cleaners.

Bearings

Remove bearings from cleaning fluid and strike larger side of cone flat aginst a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

Housings

Clean interior and exterior of housing, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in soltuion tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid skin rashes and inhalation of vapors when using alkali cleaners.

Thoroughly dry all cleaned parts immediately, using moisture-free compressed air or soft, lintless, absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

Brake Shoes

Do not use solvents or cleaning fluid on brake shoes. Thoroughly clean brake shoes with wire brush.

Relief Valves and Breathers

Flush relief valves in sun gear thrust cap assemblies with solvent; shake dry. Make sure breather passages are open.

Wash breather on axle housing with solvent; shake dry. Make sure element is not clogged.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

Bearings

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lintless cloth or paper to protect them until installed.

Oil Seals, Gaskets and Retaining Rings

Replacement of all spring-loaded oil seals, gaskets, and snap rings is more economical when unit is disassembled than to risk premature overhaul to replace these parts at a future time. Loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under of lip of seal seriously impairs its efficiency. At reassembly, lubricate lips of oil seals with Lubriplate.

Gears and Shafts

If magnaflux process is available, use process to check parts. Examine teeth and ground and polished surfaces on all gears and shafts carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts to make certain they are not sprung, bent, or splines twisted, and that shafts are true. Differential pinions and side gears must be replaced as sets. Differential ring gear and bevel pinion must also be replaced as a set if either is damaged.

Housing and Covers

Inspect housings, covers and planet carrier, and differential case to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc., are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which would cause subsequent oil leaks or failures.

Brakes

Inspect anchor pins for wear or damage. If they are worn to 1.478-inch diameter or less, or if they are pitted, scored, or deeply nicked, replace anchor pins.

Check brake shoe bushings for wear. If inside diameter exceeds 1.513 inches, replace bushings.

Check brake cam rollers for wear and distortion. If inside diameter is worn to more than 1.082 inches on Axles 130828 and 130996 or .895 inches on Axles 131197, 131508, 131715, 131721 and 190009 replace rollers. Also, if outside diameter has a flat spot more than one-fourth inch wide extending across roller face, replace the rollers.

Check cam roller pins for wear and corrosion. If worn to less than 1.045 inches diameter on Axles 130828 and 130996 or .859 inches on Axles 131197, 131508, 131715, 131721 and 190009 replace part. Also, if pin is pitted, scored or deeply nicked, replace part.

Inspect camshafts wear or corrosion of bearing surfaces. If bearing surfaces are worn to 1.723 inches or less on large diameter or 1.469 inches or less on the small diameter or if bearing surfaces are pitted, scored or deeply nicked, replace the chamshaft.

Check camshaft spindle support bushings for wear. If inside diameter is worn to 1.779 inches or more on the large bushing or 1.513 inches or more on the small bushing, replace the part.

Inspect brake drums for cracks, heat checks, scoring, or other damage. Turn down on lathe if necessary. If drum internal diameter exceeds 20.25 inches, replace drum.

Replace brake shoe return springs each time axle is overhauled.

Replace brake linings if worn to within 1/16 inch of heads of retainer bolts.

REASSEMBLY OF AXLE

The following instructions describe the procedure to be followed when reassembling and installing components of axle. Instructions cover reassembly of only one side of axle. Reassembly of opposite group is identical unless otherwise noted.

IMPORTANT: Both Grade 5 and Grade 8 fastening hardware have been used in the production of the axle assemblies covered by this manual. A table of proper torque values for both Grade 5 and Grade 8 hardware is provided at the rear of this manual. Grade of hardware may be determined by the "hash" marks contained on the head of each bolt, Grade 5 having three hash marks and Grade 8 having six hash marks as indicated below. In all cases except where specified in text, use torque value specified in table for applicable bolts.

GRADE 5 GRADE 8

Reassembly of Differential and Carrier Assembly

Reassembly of Pinion Shaft

1. Press inner pinion bearing on pinion using steel tubing for driver (Fig. 89). Driver dimensions are given in Fig. 90.

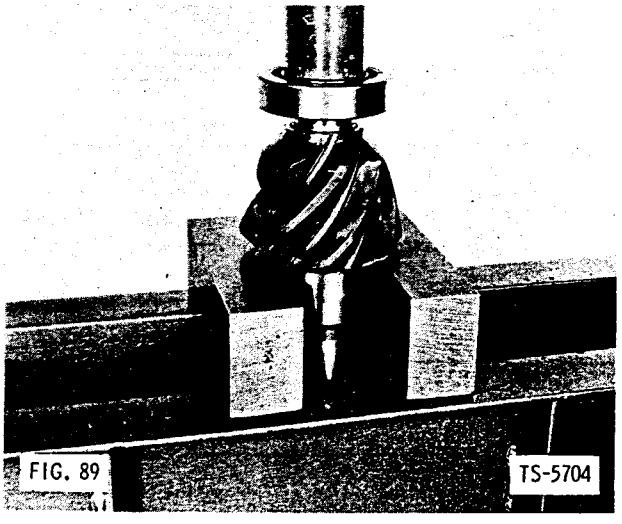


FIG. 89 TS-5704

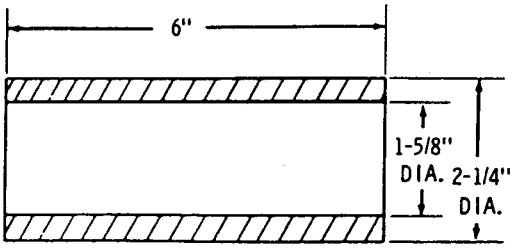


FIG. 90 1/32" RADIUS ALL CORNERS TS-8411

2. On axle Part Nos. 131508 and 190009, install inner pinion bearing retaining ring (Fig. 91).

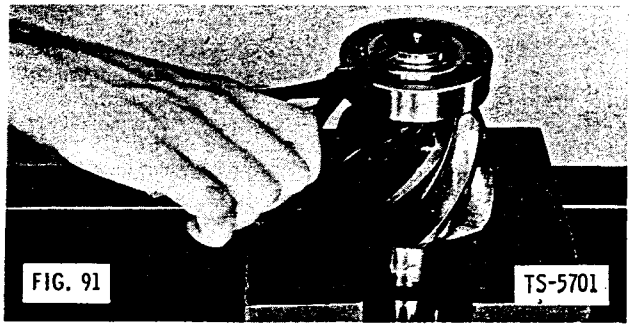
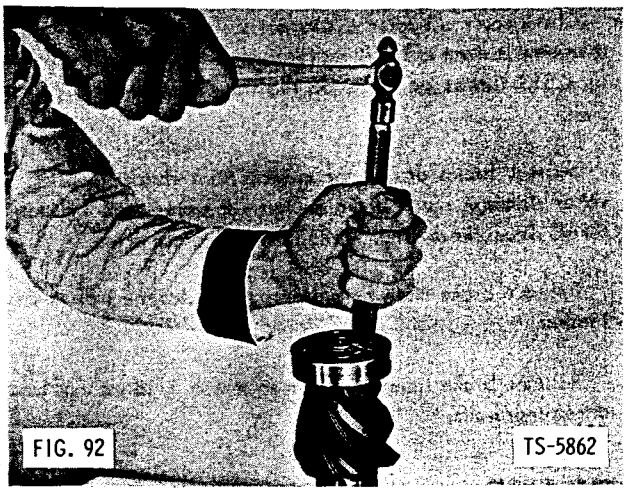


FIG. 91 TS-5701

3. On axle Part Nos. 130828, 130996, 131197, 131715, and 131721, stake pinion shaft in four places to retain bearing (Fig. 92). Use square-end staking tool as shown in Fig. 93.



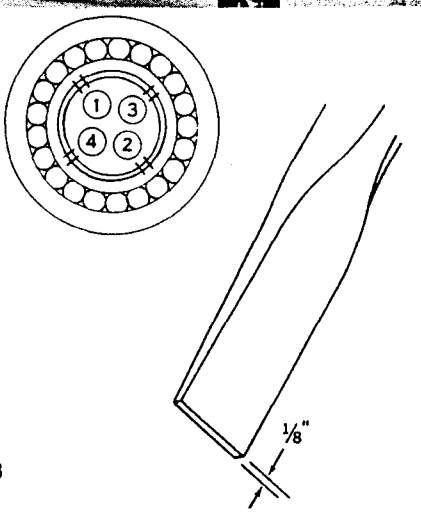
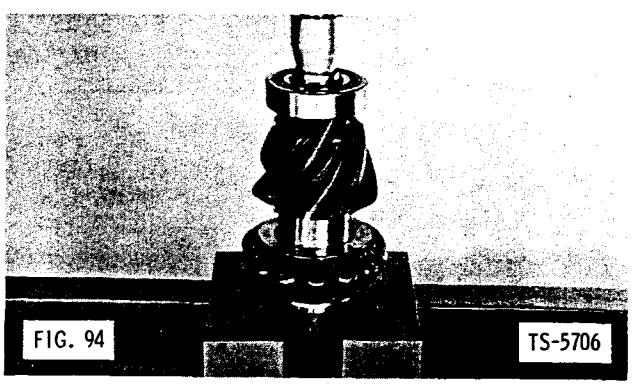
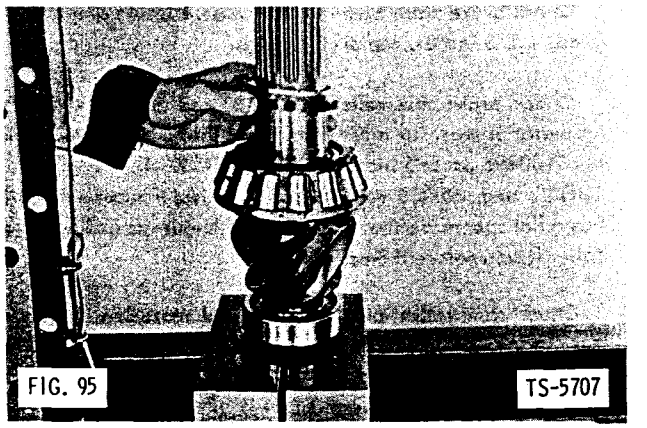


FIG. 93 TS-5402

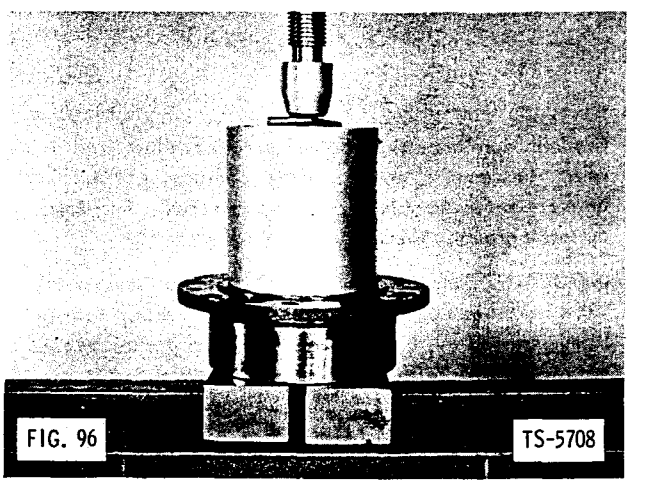
4. Press center pinion bearing cone onto pinion shaft (Fig. 94).

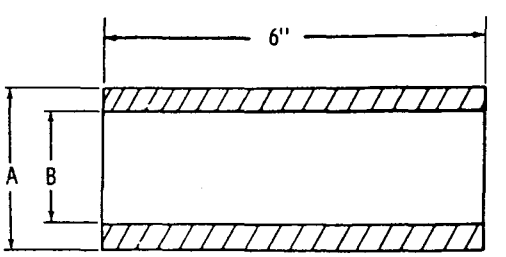


5. A pinion bearing spacer and shim kit is provided for service repair of differential and carrier assemblies. This kit, consisting of a spacer and quantity of shims, is used to obtain proper pinion bearing preload as described below. Position bearing spacer and one .010-inch shim on pinion shaft (Fig. 95).



6. Press bearing cups into pinion bearing cage (Fig. 96). Bearing driver dimensions are shown in Fig. 97.



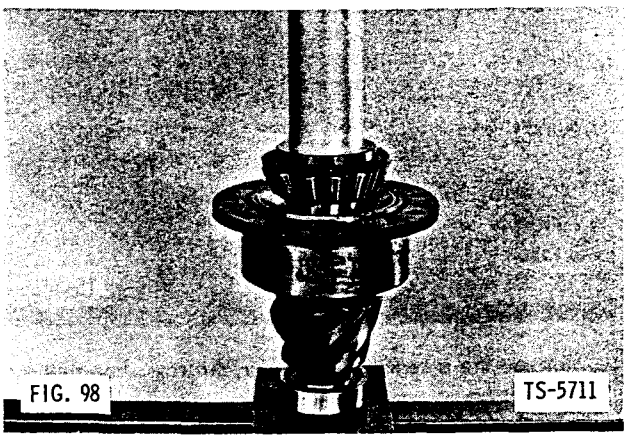


	CENTER BEARING		OUTER BEARING	
AXLE P/N	131508 190009	130828 130996 131197 131715 131721	131508 190009	130828 130996 131197 131715 131721
Dia. A	6	5-1/8	5-3/4	4-3/4
Dia. B	5-1/2	4-3/4	5-1/4	4-3/8

1/32" RADIUS ALL CORNERS

FIG. 97 TS-8412

7. Position pinion bearing cage assembly on pinion shaft. Position outer pinion bearing cone on pinion shaft and press into place using steel tubing for driver (Fig. 98). Driver dimensions are given in Fig. 99.



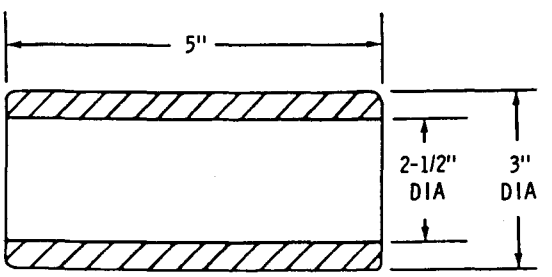
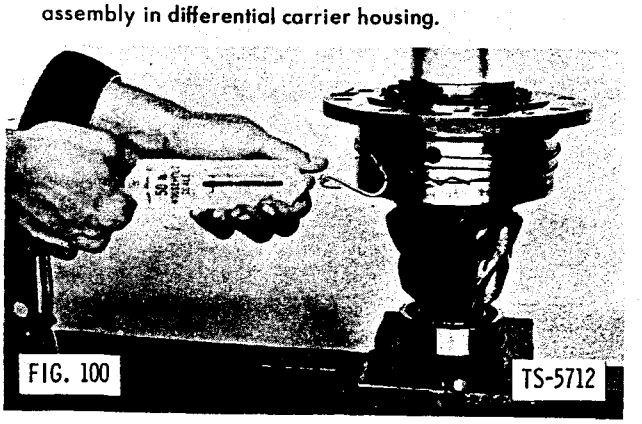


FIG. 99 1/32" RADIUS ALL CORNERS TS-8413

8. Keep pinion and cage assembly in press with approximately 500 pounds of press pressure exerted on driver. Wrap several turns of soft wire or cord around pinion cage and pull in horizontal line with spring scale. While pulling in straight line (90 degrees from centerline of shaft), read spring scale and measure rotating torque (Fig. 100). Multiply reading on spring scale by one-half diameter of bearing cage to obtain preload torque. Correct preload torque is 13 to 23 in.-lbs. If preload is not within these limits, remove shims to increase preload or add shims to decrease preload.

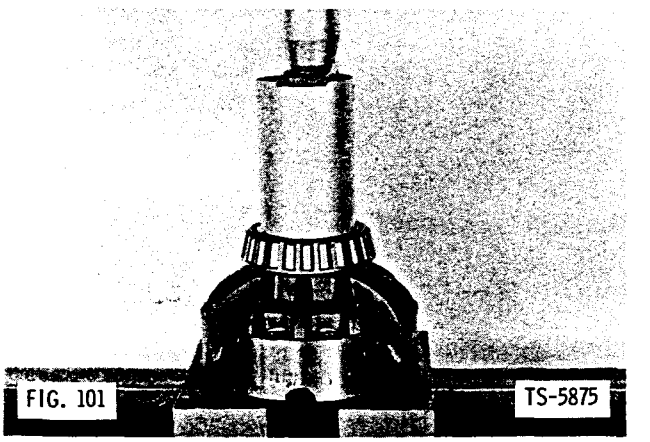
NOTE: This is a preliminary check. Final bearing preload check must be made with pinion shaft and bearing cage assembly in differential carrier housing.

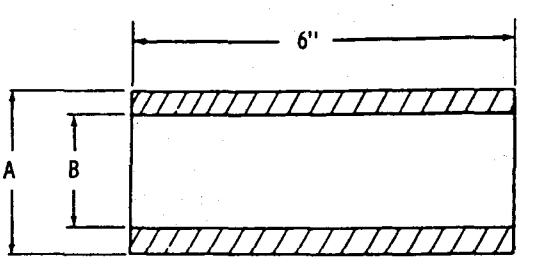


Reassembly of Differential Ring Gear and Differential Case

NOTE: Lubricate all differential bearings, gears, and thrust washers with SAE 90 EP lubricant, SCL type.

1. Press differential bearing cones on case halves (Fig. 101). Bearing driver dimensions are given in Fig. 102.



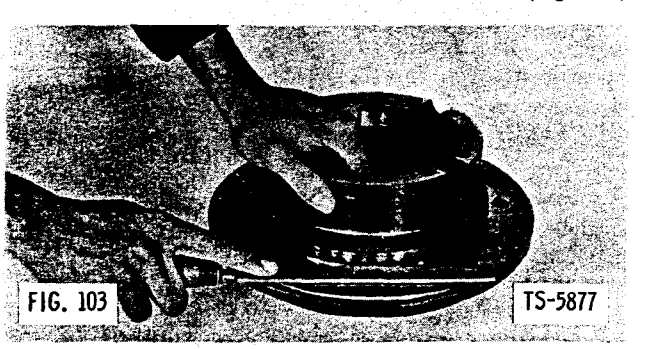


	AXLE PART NO.	
	131508 190009	130828 130996 131197 131715 131721
Dim. A	4-1/8	3-3/4
Dim. B	3-3/4	3-1/4

1/32" RADIUS ALL CORNERS

FIG. 102 TS-8414

2. Check ring gear mounting surface of flanged half of differential case for burrs. Remove burrs with file (Fig. 103).



3. Install ring gear. Install bolts so internal diameter of ring gear prevents turning of hex head. Install ring gear bolt nuts and torque to 170 to 190 ft.-lbs. (Fig. 104) for ring gears measuring 16-3/8 inches in diameter and 240 to 264 ft.-lbs. for ring gears measuring 18-1/2 inches in diameter (Fig. 104).

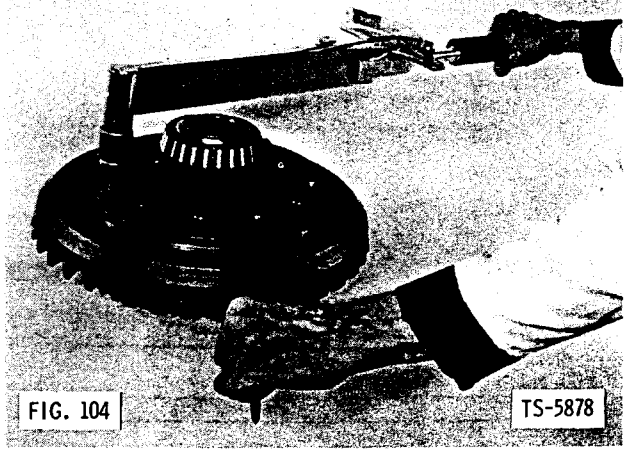


FIG. 104 TS-5878

4. Lubricate and install thrust washer and side gear in differential case and ring gear assembly (Fig. 105). Engage holes in thrust washer on dowels projecting from thrust washer bearing surface in differential case.

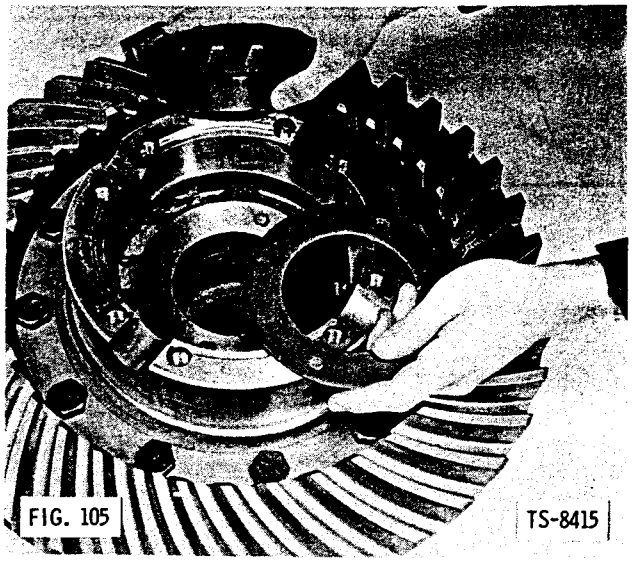


FIG. 105 TS-8415

5. Place pinions and thrust washers on differential spider, lubricate, and set in position on installed side gear (Fig. 106).

   NOTE: It is very important that tang on each pinion thrust washer engages groove in case halves as shown in Fig. 106.

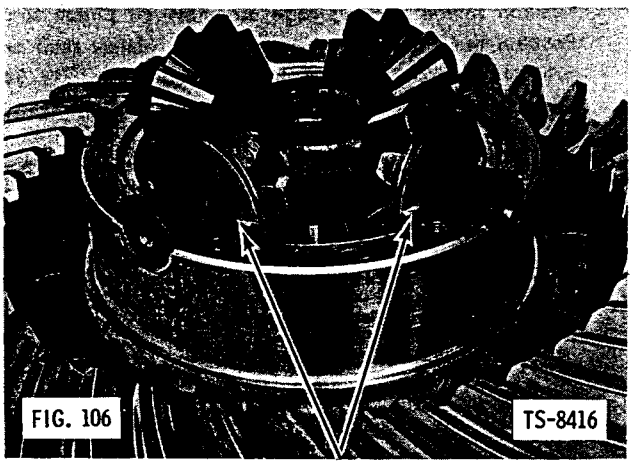


FIG. 106 TS-8416

6. Position the assembled side gear, thrust washer, and case half on the assembled parts. Make sure all thrust washers are properly seated and gear teeth are properly meshed (Fig. 107). Make sure that matchmarks made on case halves during disassembly are aligned.

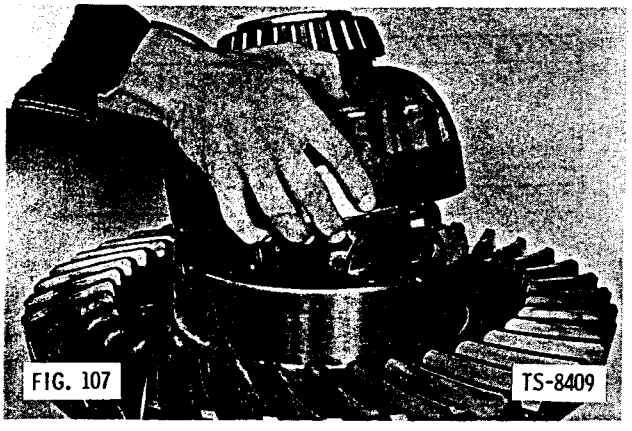


FIG. 107 TS-8409

7. Install bolts securing case halves together. Tighten to specified torque (Fig. 108). Inserting bar in oil port in case helps to hold parts while tightening bolts.

   NOTE: Axle Part Nos. 131508 and 190009 use only bolts to secure case halves together. The remaining axles in this series use bolts and self-locking nuts.

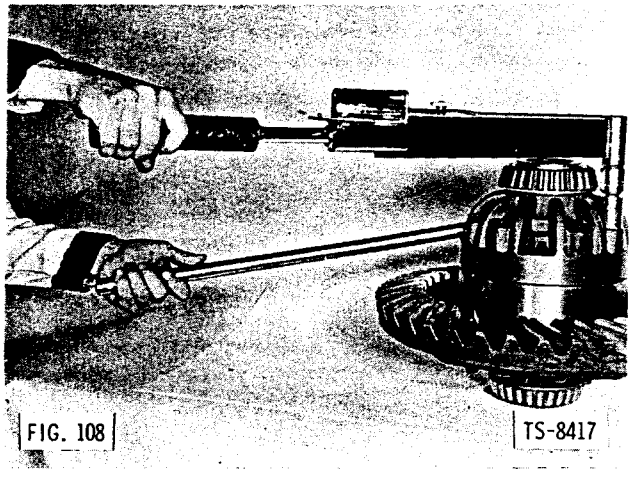


FIG. 108 TS-8417

8. On axle Part Nos. 131508 and 190009, lockwire bolts in pairs (Fig. 109).

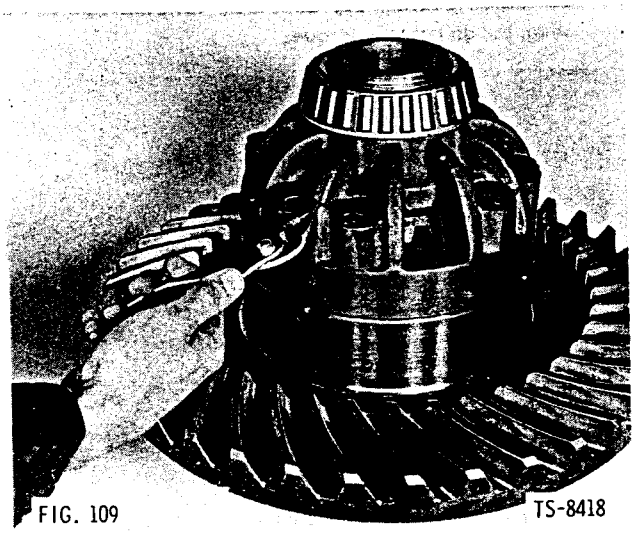


FIG. 109 TS-8418

Reassembly of Differential and Carrier

1. Install bearing cage and pinion shaft assembly in differential carrier assembly without bearing cage shims. Use four pinion oil seal retainer bolts with flat washers to pull pinion shaft assembly fully into carrier assembly (Fig. 110). Make sure oil passages are aligned. Install three flat washers on each bolt to prevent them from bottoming.

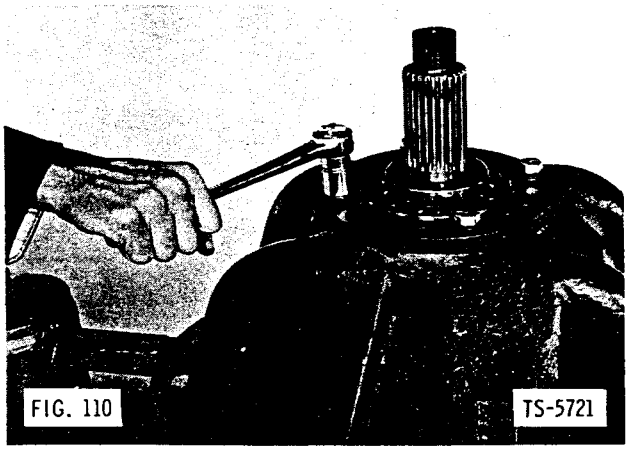


FIG. 110 TS-5721

2. Temporarily install companion flange on end of pinion shaft without installing pinion oil seal retainer. Install companion flange retaining tool on companion flange using spacers shown in Fig. 71, and torque companion flange nut (Fig. 111). Torque values are as follows:

Axle Nos. 131508 and 190009	800 ft.-lbs.
Axle Nos. 130828, 130996, 131197, 131715, 131721	600 ft.-lbs.

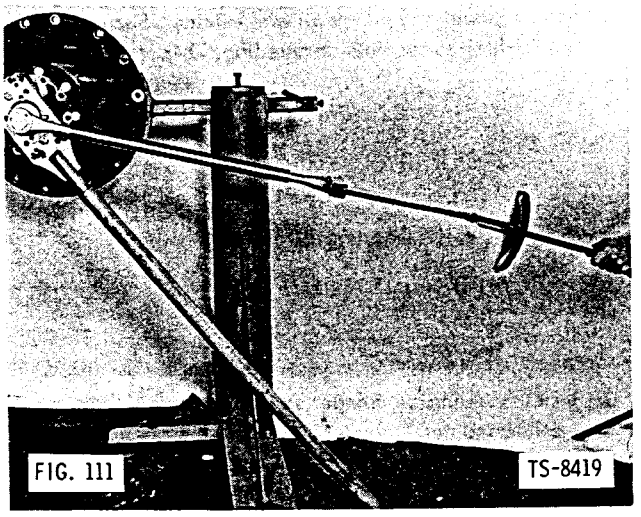


FIG. 111 TS-8419

3. Use inch-pound torque wrench to check bearing preload (Fig. 112). If bearing preload is not between 13 and 23 in.-lbs., disassemble parts and add shims to decrease preload or remove shims to increase preload. When correct preload is attained, remove companion flange and remove seal retainer bolts that are used to hold bearing cage to housing.

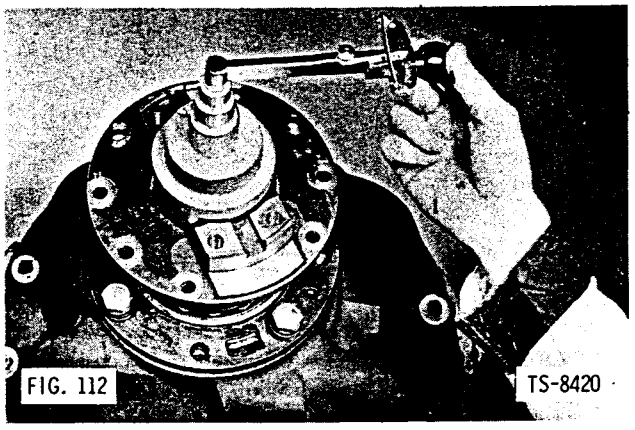


FIG. 112 TS-8420

4. Coat outside diameter of pinion shaft oil seal with Permatex No. 2 and press seal into oil seal retainer (Fig. 113). Lip of seal must face toward pinion. Coat lip with Lubriplate.

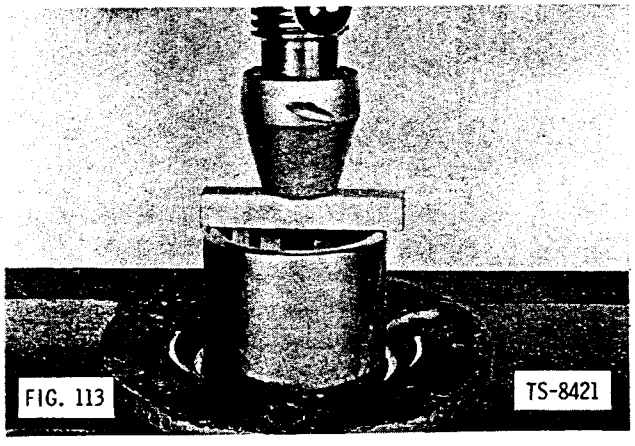


FIG. 113 TS-8421

5. Install gasket and pinion oil seal retainer. Secure with bolts and tighten to specified torque (Fig. 114).

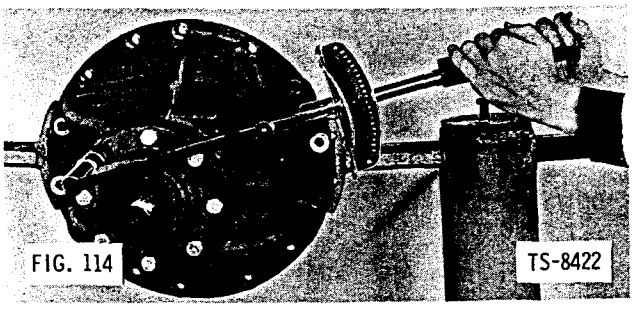


FIG. 114 TS-8422

6. Install companion flange on end of pinion shaft with flat washer and nut. Tighten nut as shown in Fig. 111 to torque specifications given in step 2. Secure nut with cotter pin.

7. Position differential carrier and pinion assembly in differential stand so that pinion shaft is down. Insert bar through differential to facilitate hoisting. Position differential into carrier (Fig. 115).

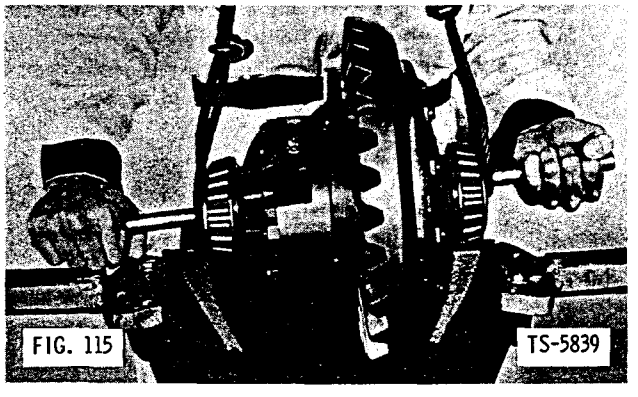


FIG. 115 TS-5839

8. Position differential bearing cup and differential adjusting nut on lifting bar on one side of differential and lift bar slightly with hoist. Position bearing cup and adjusting nut in position on carrier (Fig. 116). Repeat procedure and install opposite bearing cup and adjusting nut. Take care to prevent cross-threading of nuts.

NOTE: If differential bearing cones were replaced, new bearing cups must be used.

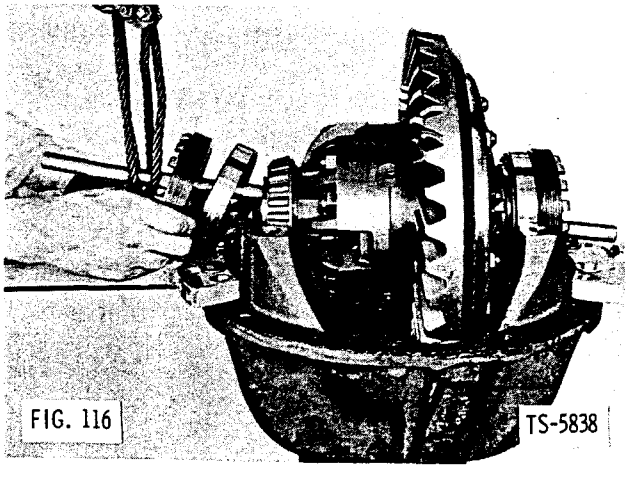


FIG. 116 TS-5838

9. Position bearing caps on bearings and nuts, making sure matchmarks made during disassembly are properly aligned. Install bearing cap bolts (Fig. 117) and tighten until snug, but do not fully torque.

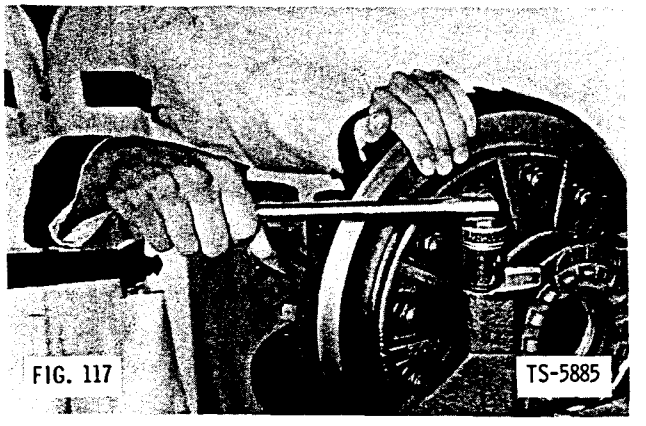


FIG. 117 TS-5885

10. Tighten bearing adjusting nuts to adjust bearings to zero end play (Fig. 118). This condition may be checked with screwdriver as shown (Fig. 119). All bearing rollers must rotate as ring gear rotates, but it should not be possible to move bearing rollers sideways in cage when prying against them with screwdriver.

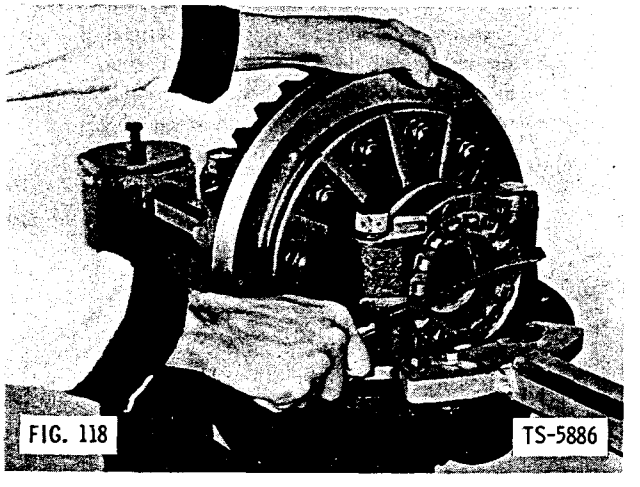


FIG. 118 TS-5886

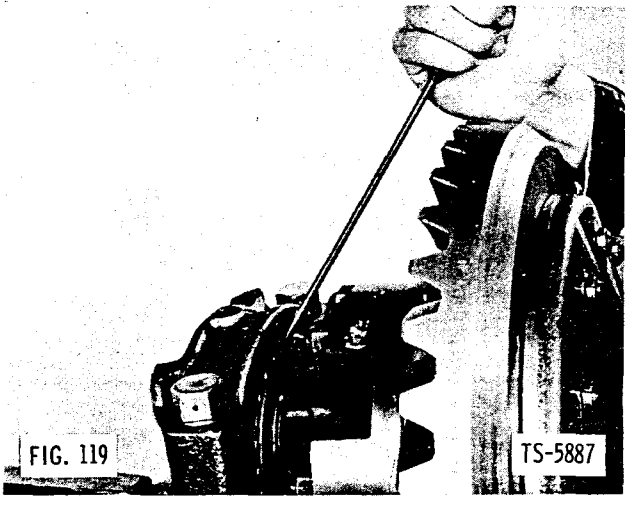


FIG. 119 TS-5887

11. Use a dial indicator to check backlash between ring gear and pinion shaft gear. Backlash is adjusted by moving ring gear toward or away from pinion shaft gear as shown in Fig. 120. Move ring gear by loosening one adjusting nut and tightening opposite lock nut. When loosening one lock nut and tightening opposite, move each lock nut same distance so that bearing adjustment made in previous paragraph is not disturbed. Adjust position until gear backlash is between .009 inch and .013 inch for ring gears measuring 16-3/8 inches in diameter and .010 to .015 for ring gears measuring 18-1/2 inches in diameter if new gear set is used. Adjust to backlash noted at disassembly for old gears if original ring and pinion set is re-used.

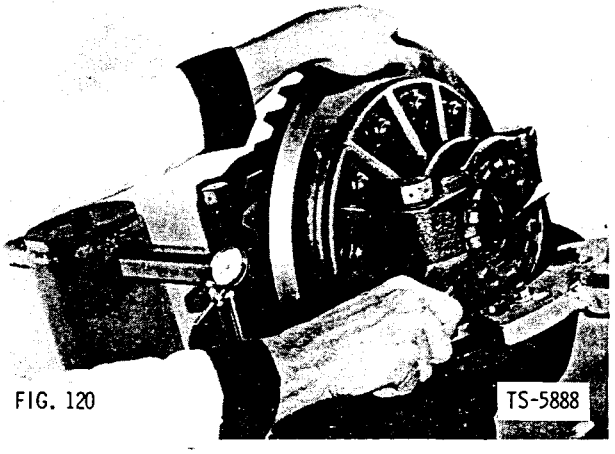


FIG. 120

12. Check ring and pinion gear for proper tooth contact. Paint ring gear teeth with a mixture of red lead and linseed oil (Fig. 121). When ring and pinion gears are rotated, the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. As a rule, painting about 10 or 12 teeth is sufficient for checking purposes. Sharper impressions may be obtained by applying a small amount of resistance to the ring gear with a flat steel bar and using a wrench to rotate the pinion. Gears should be rotated, under slight load, until ring gear has turned at least one revolution in both directions. Check tooth contact pattern on drive side (convex side) of ring gear teeth. Coast side will automatically correct when drive side pattern is correct.

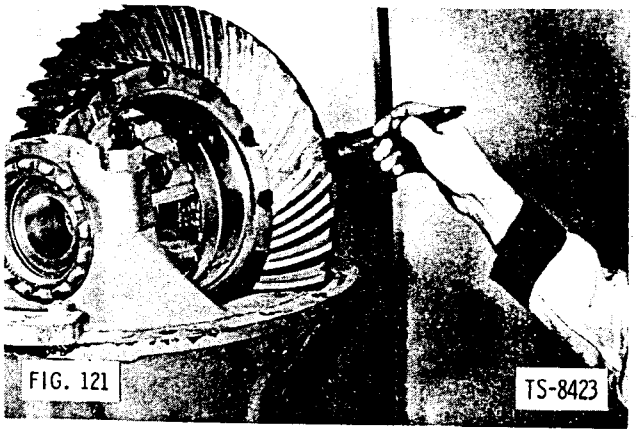


FIG. 121

Refer to gear tooth contact chart (Fig. 124). If proper tooth contact pattern is not as shown, readjust backlash or add or remove pinion bearing cage shims as necessary. Shims are provided for removal or insertion between bearing cage and differential housing. Mark seal retainer flange, bearing cage flange and differential housing to identify relative position of parts. Remove retainer bolts and rotate seal retainer until two holes, diametrically opposite, line up with puller bolt holes in bearing cage. Insert puller bolts and pull bearing cage outward sufficiently to permit insertion or removal of split shims as required. Align seal retainer, bearing cage, and housing identification marks; reinsert and tighten bolts per torque specifications.

13. Tighten bearing cap bolts (Fig. 122) per torque specifications. With dial indicator, recheck ring gear and pinion backlash. Recheck differential bearings for end play as described in step 10.

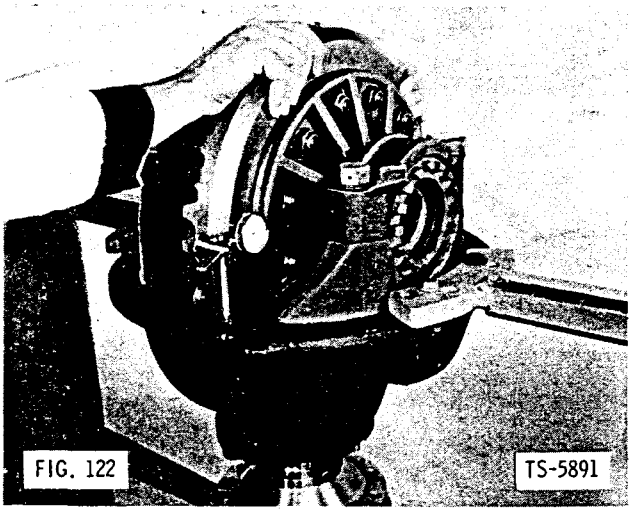


FIG. 122

14. Use dial indicctor to check back face of ring gear. Rotate at least one full turn (Fig. 123). Runout must not exceed .005-inch total indicator reading. If runout is excessive, remove assembly and check for burrs or dirt under mounting surface of ring gear. Reassemble and recheck.

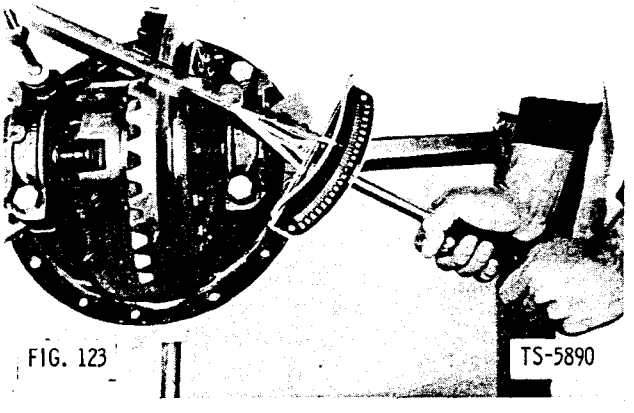
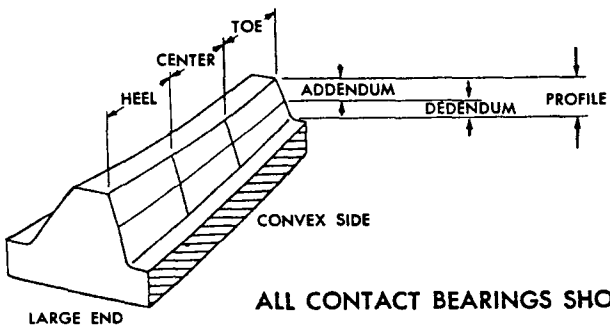
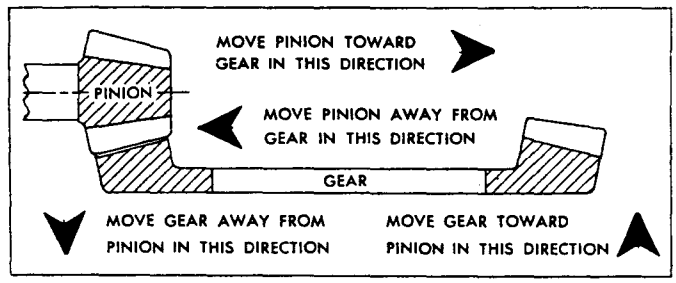


FIG. 123

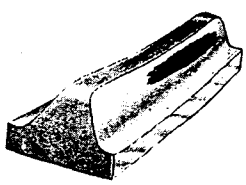
CLARK EQUIPMENT

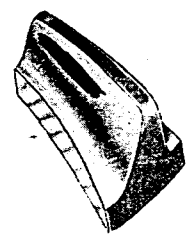
SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART





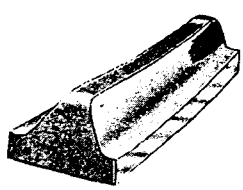
ALL CONTACT BEARINGS SHOWN BELOW ARE ON RIGHT HAND SPIRAL RING GEAR — THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

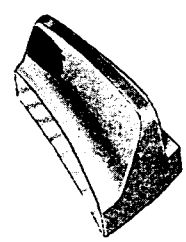




CONDITION 1

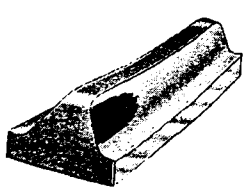
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

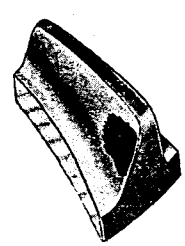




CONDITION 2

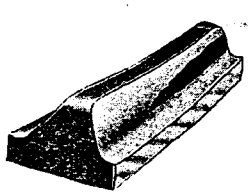
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

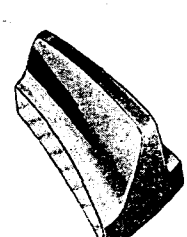




CONDITION 3

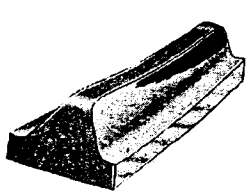
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION.

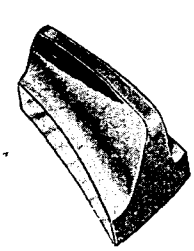




CONDITION 4

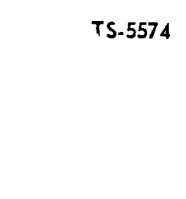
LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR. INCREASE MOUNTING DISTANCE BY ADDING SHIMS BETWEEN BEARING CAGE AND DIFFERENTIAL HOUSING.





CONDITION 5

HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION IN TOWARD GEAR. DECREASE MOUNTING DISTANCE BY REMOVING SHIMS FROM BETWEEN BEARING CAGE AND DIFFERENTIAL HOUSING.



BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

Fig. 124

TS-5574

15. Install adjusting nut lock with bolt and lockwasher and tighten to specified torque (Fig. 125).

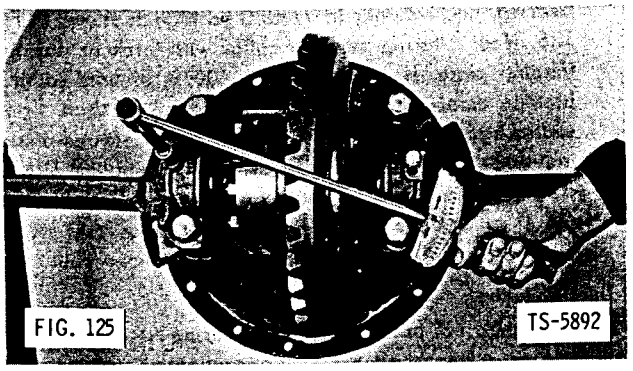


FIG. 125 TS-5892

16. Lockwire together the bearing cap bolts and adjusting nut lock bolt (Fig. 126).

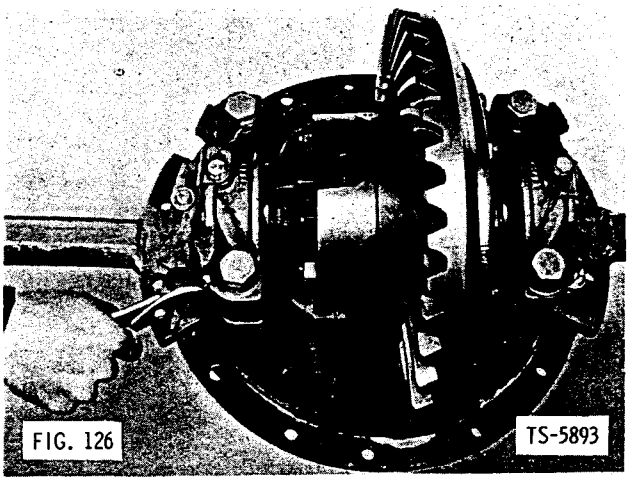


FIG. 126 TS-5893

17. If differential is equipped with differential thrust screw, apply light coat of Permatex No. 2 to screw threads and turn in screw until it just contacts back of ring gear, then back off 1/4 turn (.010-inch clearance). Tighten lock nut and secure by bending tang of lockwasher against flat of nut to secure adjustment.

Reassembly of Spindle Assembly

1. If bushing was removed, press in new bushing (Fig. 127). Edge of bushing must be 1/8 inch beyond edge of spindle bore as shown in Fig. 128. Drive dimensions are shown in Fig. 129.

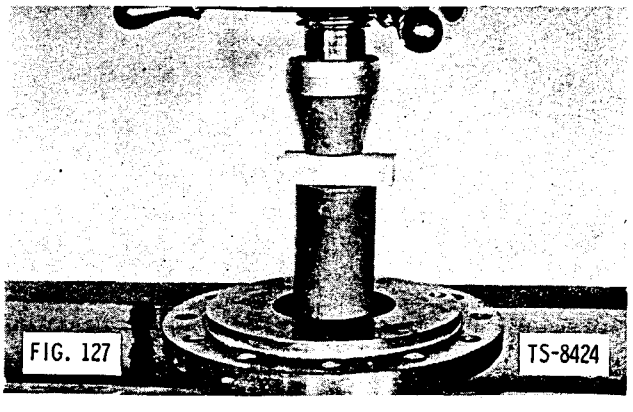


FIG. 127 TS-8424

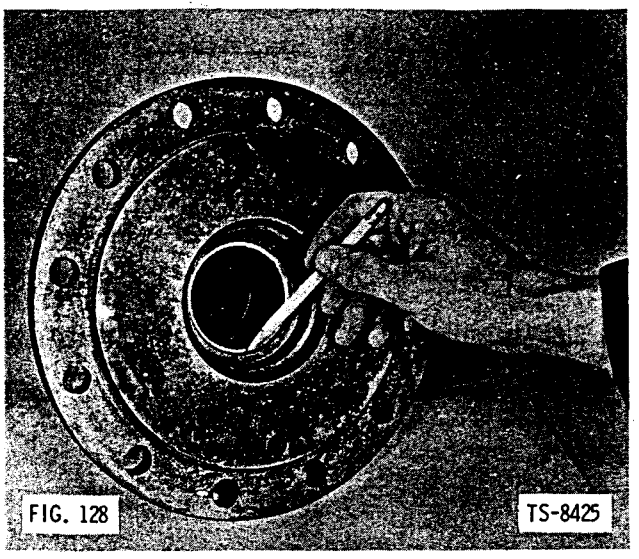


FIG. 128 TS-8425

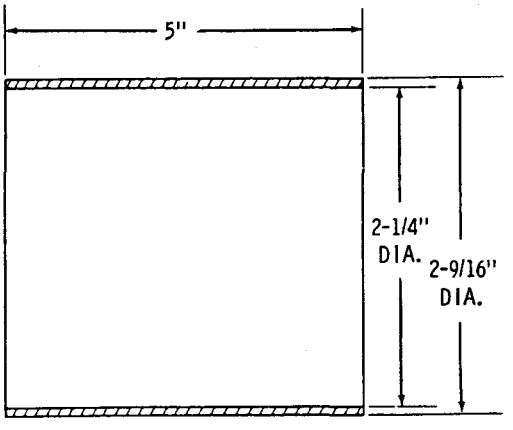


FIG. 129 1/32" RADIUS ALL CORNERS TS-8426

2. Apply light coating of Permatex No. 2 to outer diameter of wheel shaft oil seal and press seal into spindle (Fig. 130). Seal driver dimensions are given in Fig. 131. Wipe off excess Permatex. Lip of oil seal must face downward with spindle as shown. Coat lip of seal and wear surface of bushing with Lubriplate.

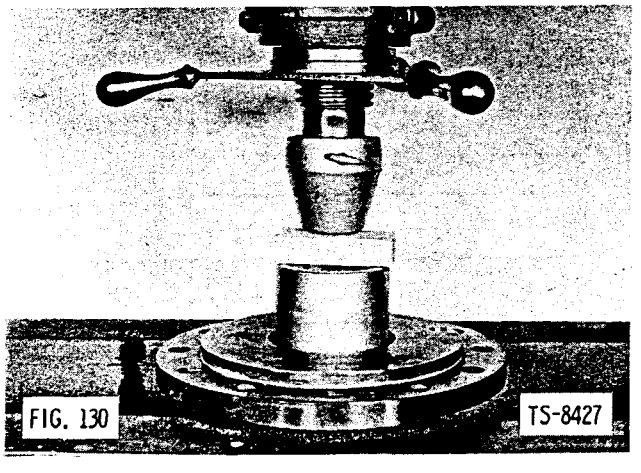


FIG. 130 TS-8427

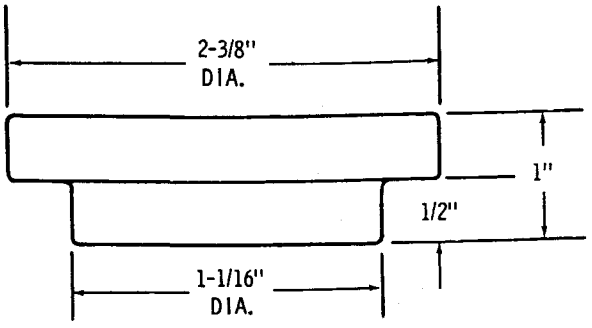


FIG. 131 1/32" RADIUS ALL CORNERS TS-8428

3. Tap wheel shaft oil seal washer into seat in spindle. Stake spindle in three places to retain in position (Fig. 132).

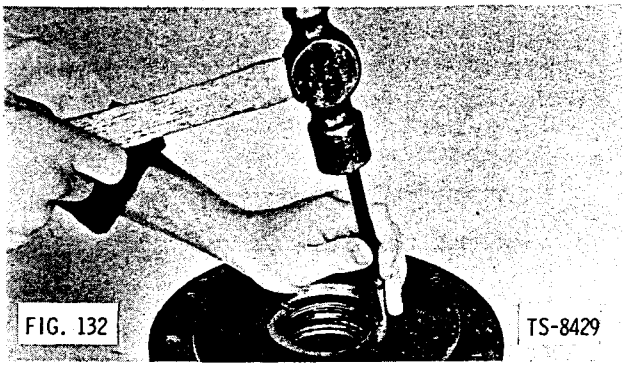


FIG. 132 TS-8429

Reassembly of U-Joint and Axle Shaft

1. Press seal into axle shaft bearing retainer (Fig. 133), using driver with dimensions shown in Fig. 134. Lip must face upward when retainer is positioned as shown. Coat lips with Lubriplate.

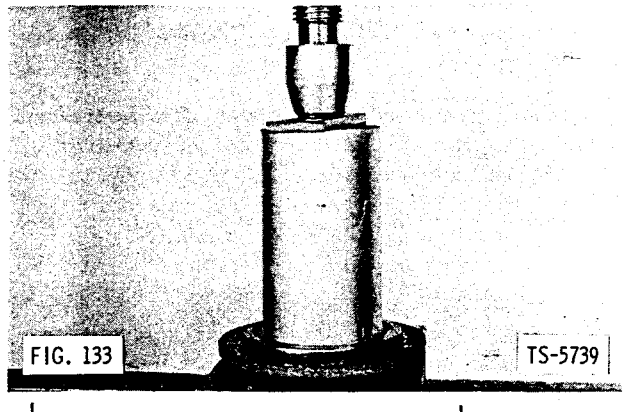


FIG. 133 TS-5739

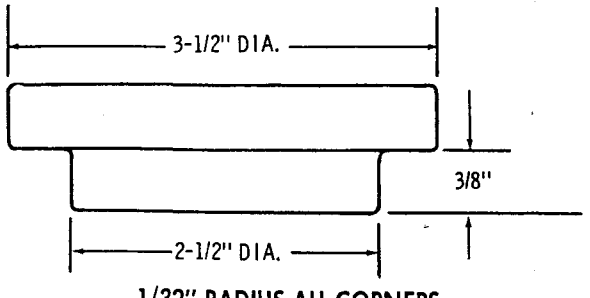


FIG. 134 1/32" RADIUS ALL CORNERS TS-8430

2. Assemble bearing retainer and seal on shaft. Press bearing in place, formly against shoulder of shaft. Position shaft, bearing, and retainer in vertical position as shown in Fig. 135. Heat bearing retainer collar with torch or portable heating plate. Heat to 300° F to 600° F, or until collar is blue in color. Collar must be positioned on shaft, firmly seated against inner race of bearing. Use rapid and steady movement when transferring collar from heating plate to axle shaft, using tongs. Speed is necessary to prevent cooling of collar during transfer to prevent collar from seizing on shaft in position that will leave gap between collar and bearing.

NOTE: Do not attempt to reuse bearing retainer collar or to press it from shaft. Pressing operation will remove metal from inside of collar, resulting in improper or loose fit on shaft.

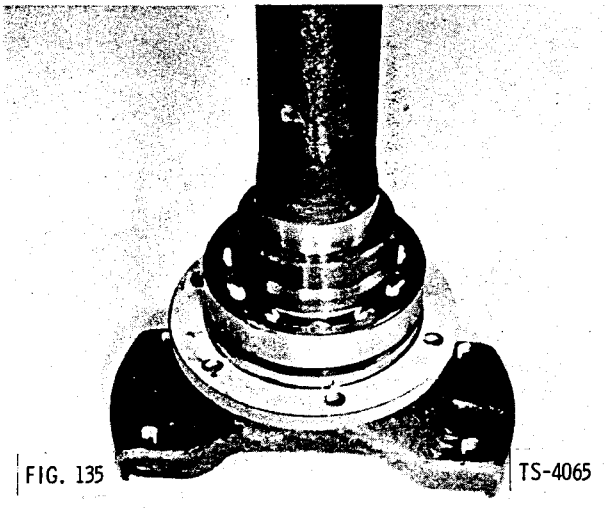


FIG. 135 TS-4065

3. Position U-joint parts together with bolts and tighten to specified torque (Fig. 136).

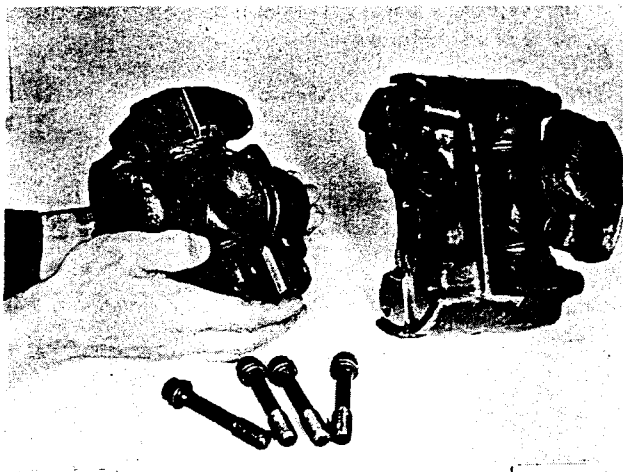


FIG. 136 TS-8399

4. Bolt U-joint to wheel side axle shaft. Tighten bolts to specified torque (Fig. 137). Insert bar through U-joint parts to prevent assembly from turning as bolts are torqued.

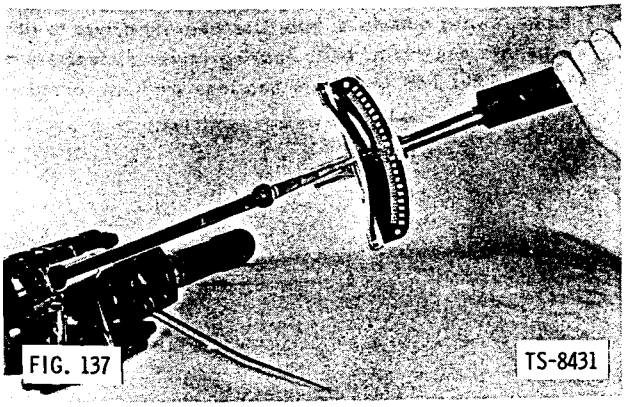


FIG. 137 TS-8431

Reassembly of Internal Gear and Hub

1. Check that bearing seat on hub is free of nicks and burrs. Press bearing cone on hub using bearing driver (Fig. 138). Bearing driver dimensions are given in Fig. 139.

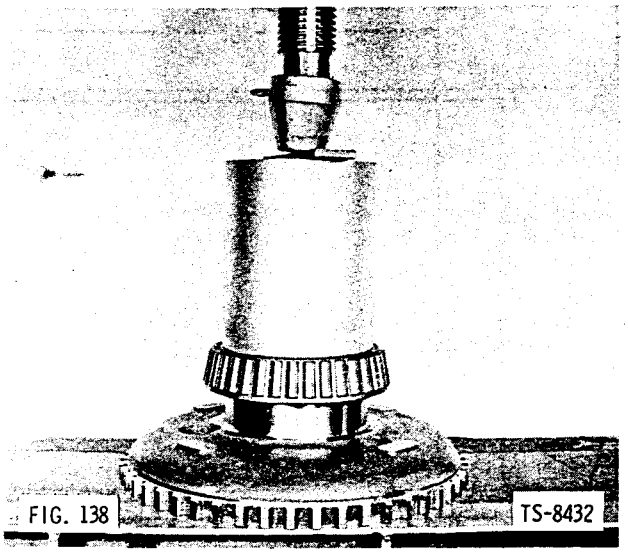


FIG. 138 TS-8432

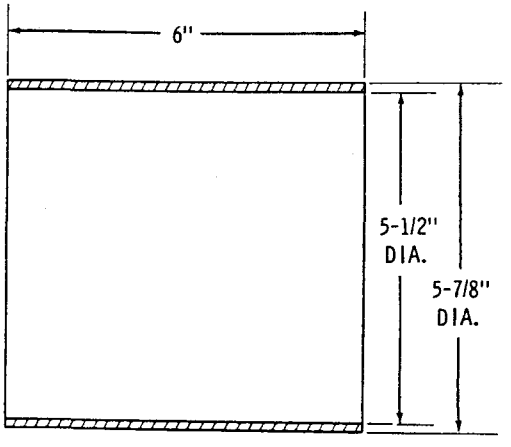


FIG. 139 1/32" RADIUS ALL CORNERS TS-8433

2. Position hub on internal gear. Secure with bolts, lockwasher, and hub-to-gear retaining plates. Tighten bolts to specified torque (Fig. 140). Make sure matchmarks made during disassembly are aligned.

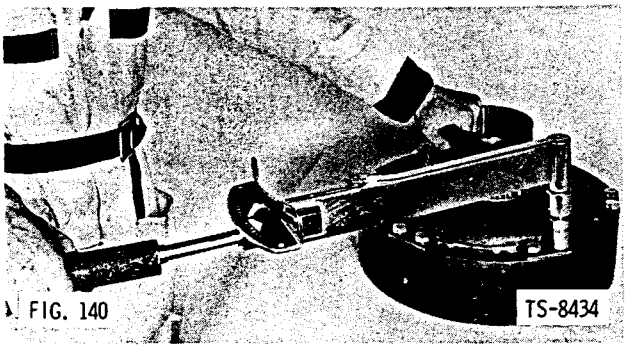


FIG. 140 TS-8434

3. Lockwire hub and drum attaching bolts in pairs (Fig. 141).

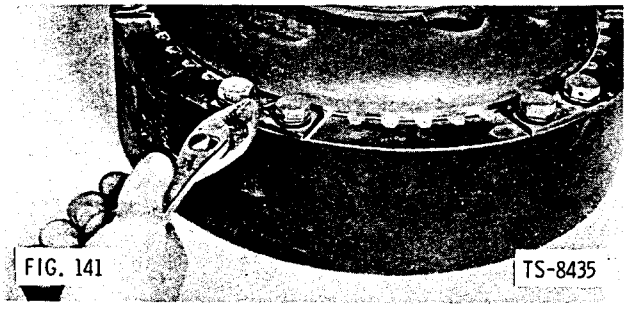


FIG. 141 TS-8435

Reassembly of Brake Shoes

1. Install brake lining on brake shoes with washers and nuts. Torque nuts to 200 to 220 in.-lbs. (Fig. 142). Tighten nuts in sequence shown in Fig. 143.

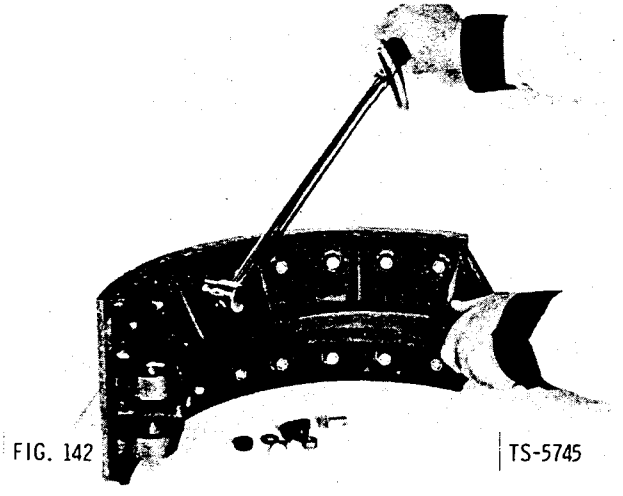


FIG. 142 TS-5745

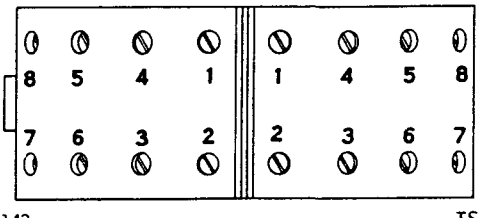


FIG. 143 TS-5746

2. Position brake cam roller on brake shoe. Apply light coat of Never-Seez on brake cam roller pin and insert pin. Secure pin with cam roller pin lock pin and cotter pin (Fig. 144).

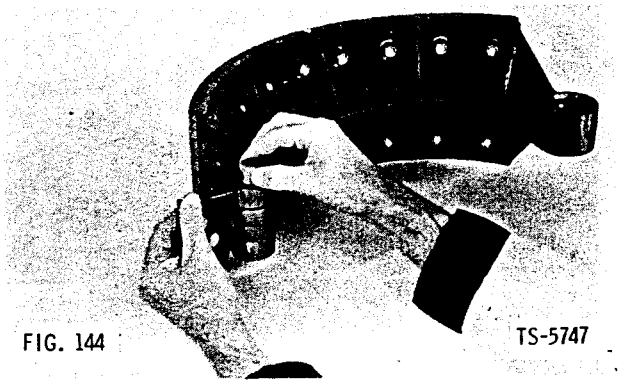


FIG. 144 TS-5747

3. Press brake shoe bushings into brake shoe (Fig. 145).

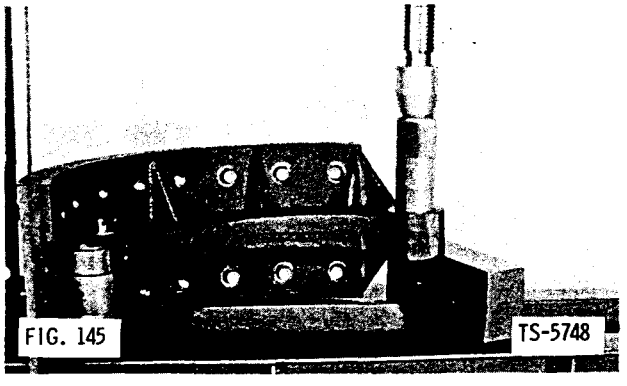


FIG. 145 TS-5748

Reassembly of Hub and Drum

1. Tap wheel studs into place, taking care not to damage threads (Fig. 146). Secure with self-locking nuts torqued to 200 ft.-lbs.

   NOTE: If any wheel studs must be replaced, replace the entire set. Do not replace individual wheel studs.

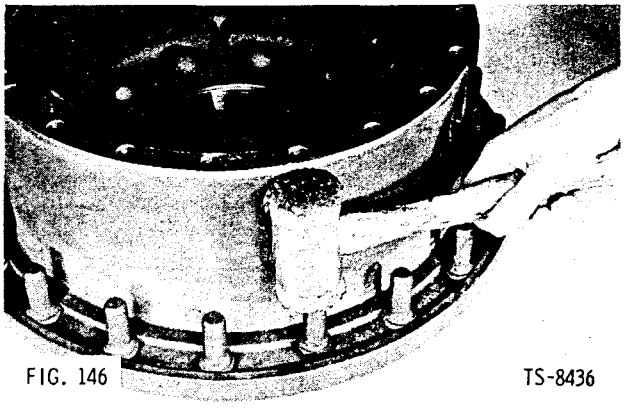


FIG. 146 TS-8436

2. Check bearing bores in wheel hub to be sure all nicks and burrs have been removed from both bores and bearing seats. Install bearing cups in hub with wide diameter of taper toward outside of hub. Use bearing driver to drive cups into place (Fig. 147). Bearing driver dimensions are given in Fig. 148. Make sure bearings are fully seated.

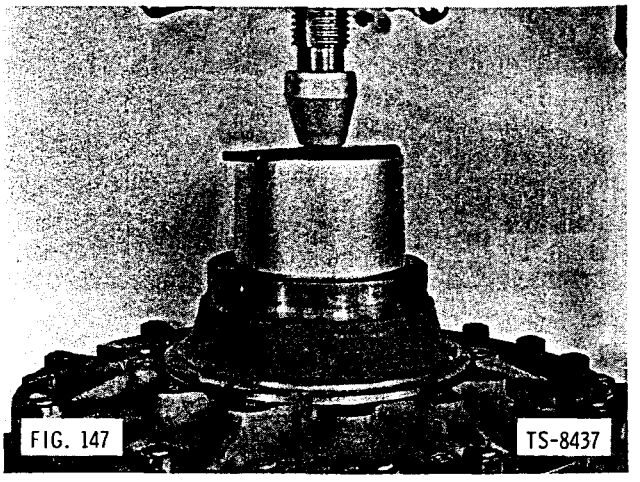
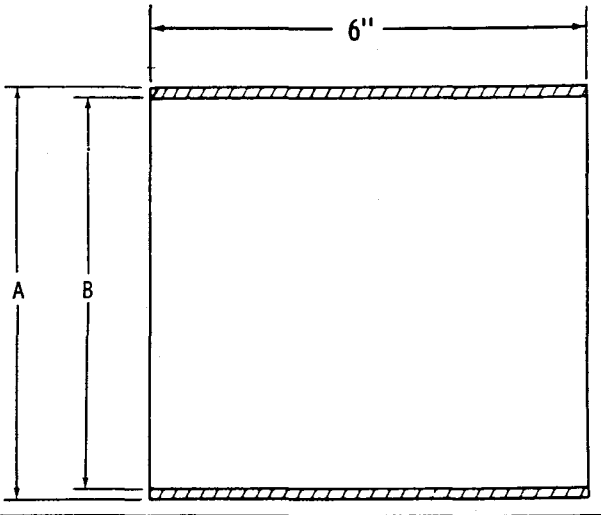


FIG. 147 TS-8437



	INNER CUP	OUTER CUP
A	6-1/2"	7-1/2"
B	6"	7"

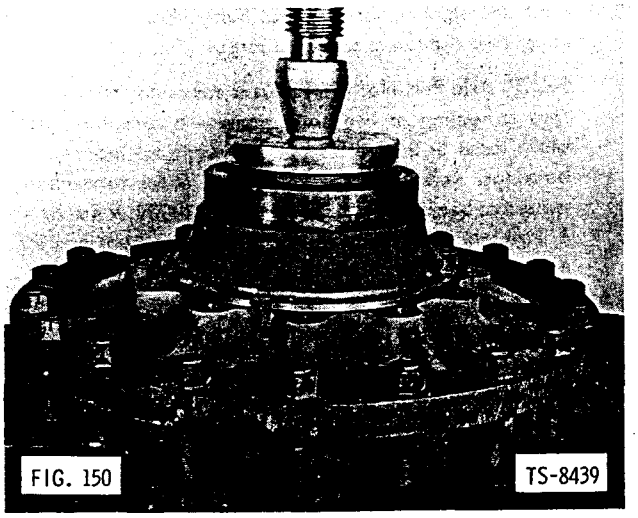
1/32" RADIUS ALL CORNERS

FIG. 148 TS-8438

3. Lubricate inner bearing cone with gear oil. Install cone in inner bearing cup (Fig. 149).

FIG. 149 TS-8390

4. Press seal into place using driver (Fig. 150). Driver dimensions are given in Fig. 151.



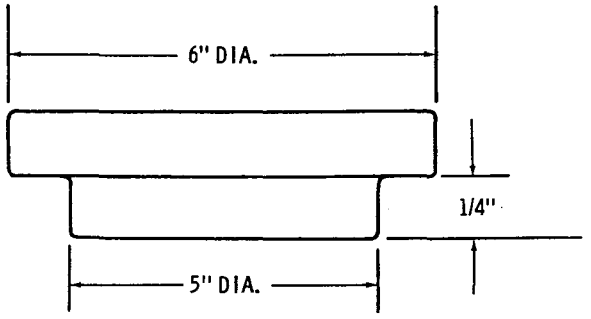
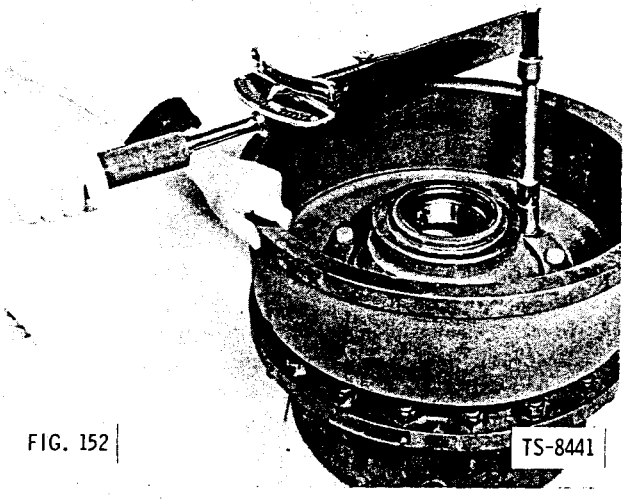
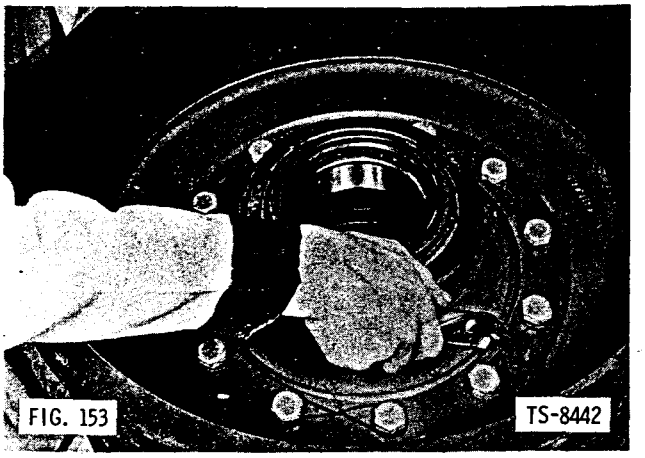


FIG. 151 1/32" RADIUS ALL CORNERS TS-8440

5. Position brake drum on hub, aligning match marks made at disassembly. Install bolts and flat washers. Tighten bolts to specified torque (Fig. 152).

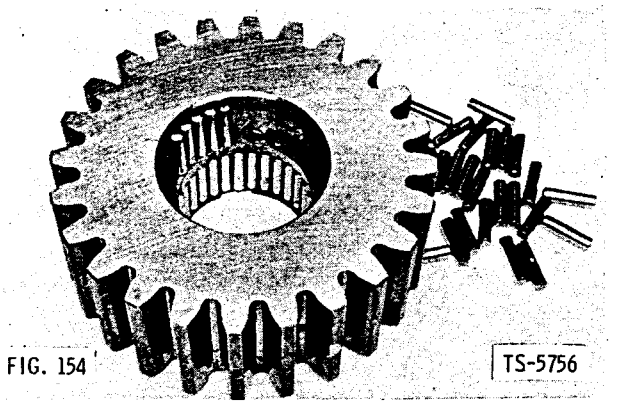


6. Lockwire bolts in pairs (Fig. 153).

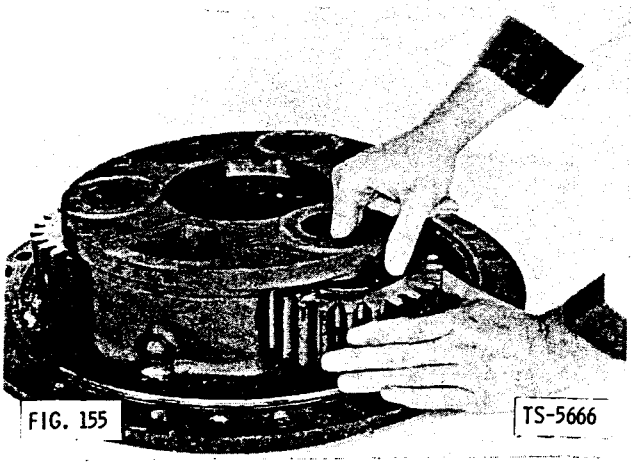


Reassembly of Planet Carrier Assembly

1. Coat inside of planet pinion with chassis grease to retain pinion needle rollers. Each pinion contains a double row of needle rollers with a spacer between rows. Install a row of 28 rollers, roller spacer and another row of 28 rollers in each pinion (Fig. 154).



2. Position assembled pinion and two pinion thrust washers in planet carrier, making sure tangs on thrust washer engage the grooves in the spider (Fig. 155).



3. Press in pinion shaft, making sure the pinion shaft ball recess aligns with groove in spider. Insert pinion shaft ball and complete press (Fig. 156). Press end of pinion shaft flush with face of carrier.

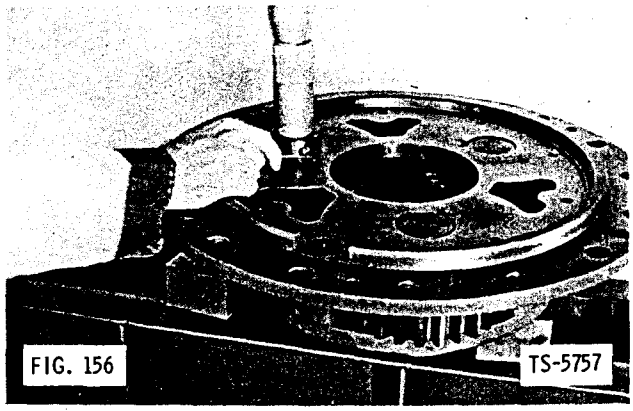


FIG. 156 TS-5757

4. Stake pinion shaft ball groove in two places to retain shaft (Fig. 157).

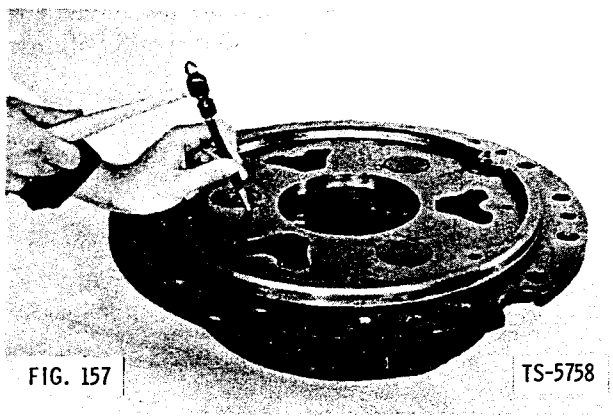


FIG. 157 TS-5758

Reassembly of Axle Parts

1. Make sure joining surfaces of differential and carrier housing and axle housing are clean. For axle Part Nos. 131508 and 190009, apply a thin coat of gasket cement to the axle housing surface. Position the gasket in place and apply a thin coat of gasket cement to the top of the gasket (Fig. 158). On all remaining axles in the series, apply thin coat of Permatex No. 2 to mating surface of axle housing.

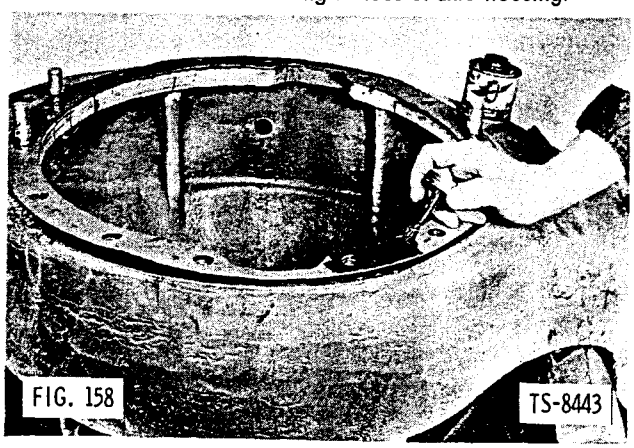


FIG. 158 TS-8443

2. Position differential and carrier assembly on axle housing. Install dowels, washers, and nuts on studs. Install bolts and washers. Tighten all bolts and nuts evenly until they are snug; then tighten to specified torque (Fig. 159).

   NOTE: Axle Part No. 190009 uses spherical trunnion bearings consisting of two solid parts – a cone and cup. All other axles in this series use conventional tapered roller bearings. Refer to steps 3 through 5 for reassembly of spherical bearings for axle Part No. 190009. Refer to steps 6 through 8 for reassembly of trunnion bearings for all other axles in this series.

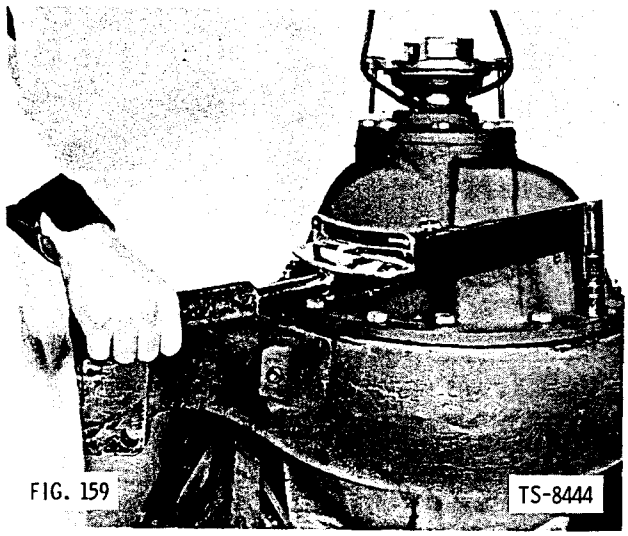


FIG. 159 TS-8444

3. Position expansion plug, convex side out, in trunnion bearing bore. Rap center of expansion plug sharply with hammer to expand into position (Fig. 160).

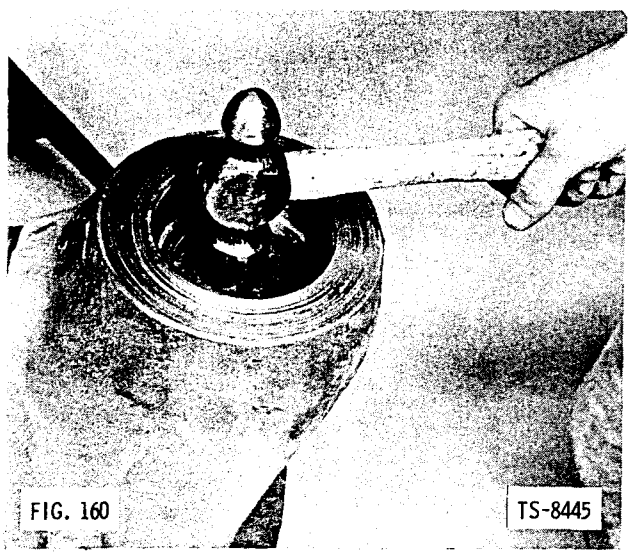


FIG. 160 TS-8445

4. Install lower trunnion bearing cup using driver as shown (Fig. 161). Exercise care to prevent damage to cup or bore. Turn housing over and install upper expansion plug and trunnion bearing cup. Driver dimensions are given in Fig. 162. Pack both trunnion bearings one-fourth full of lithium soap grease, light oil base, No. 1 consistency.

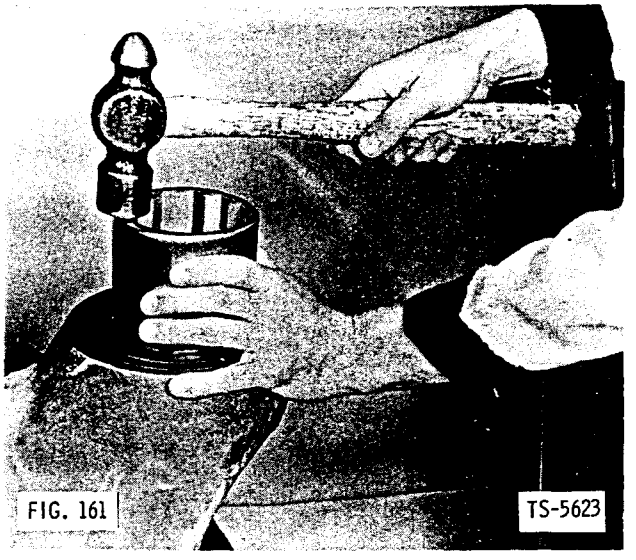
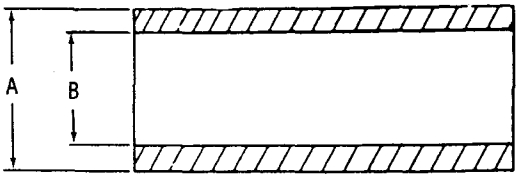


FIG. 161 TS-5623



	UPPER CUP	LOWER CUP
Dim. A	3-1/8	4
Dim. B	2-7/8	3-1/2

1/32" RADIUS ALL CORNERS

FIG. 162 TS-8447

5. If bearing cups were replaced, bearing cones must also be replaced. Heat bearing cones in oven to 300° F. Remove cones from oven and quickly position on steering trunnions. Heated cones should seat easily on trunnions (Fig. 163).

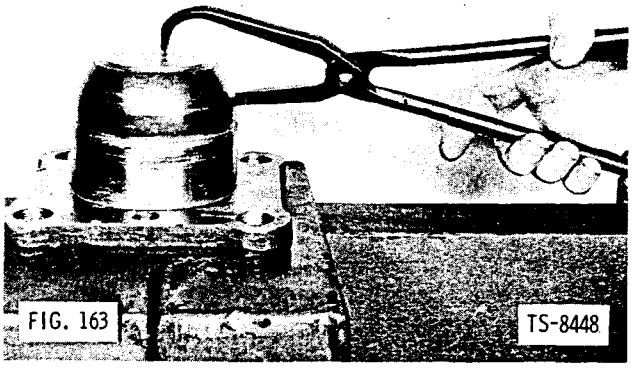


FIG. 163 TS-8448

6. For all axles of the series other than Part No. 190009, apply light coat of Permatex No. 2 to flange of oil retainer. Install oil retainer in trunnion bearing bore (Fig. 164). Wipe off excess Permatex.

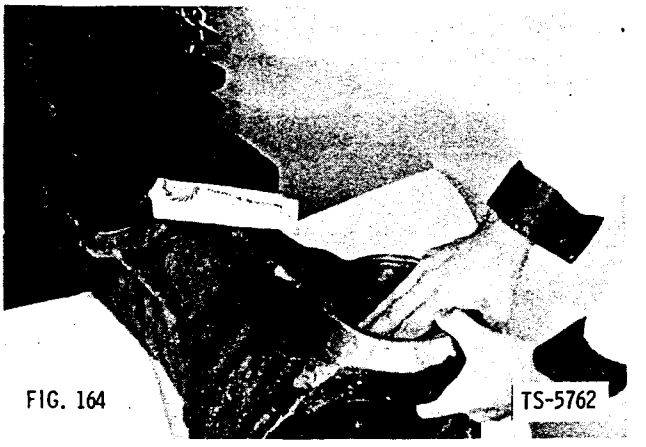


FIG. 164 TS-5762

7. Install upper trunnion bearing cup using bearing driver as shown (Fig. 165). Exercise care to prevent damage to cup or bore. Turn housing over and install lower oil retainer and trunnion bearing cup. Bearing driver dimensions are given in Fig. 166.

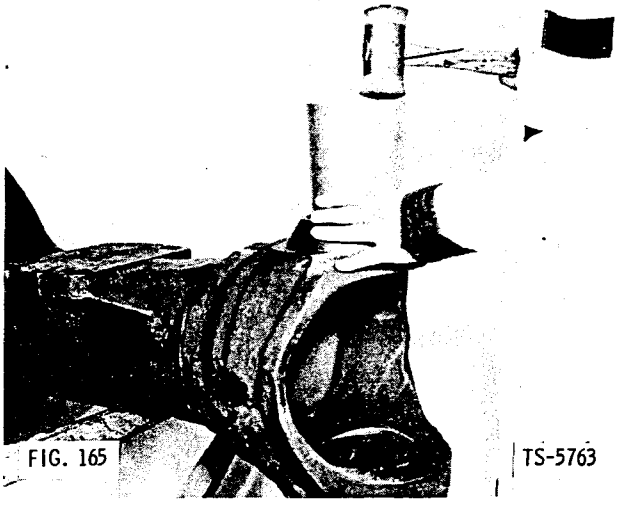
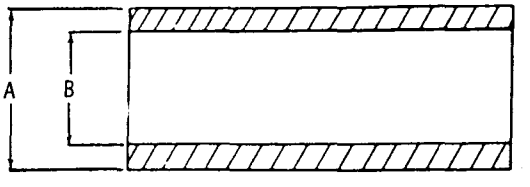


FIG. 165 TS-5763



	UPPER CUP	LOWER CUP
Dim. A	3-15/16	5-1/4
Dim. B	3-1/2	5-3/4

1/32" RADIUS ALL CORNERS

FIG. 166 TS-8449

8. Pack upper trunnion bearing cone with lithium soap grease, light oil base, No. 1 consistency, and insert into lower trunnion bearing cup. Coat outer diameter of oil seal with light coating of Permatex No. 2 and install seal in housing

with lip pointing out (Fig. 167). Make sure seal is fully seated. Wipe off excess Permatex. Lubricate lip of seal with Lubriplate.

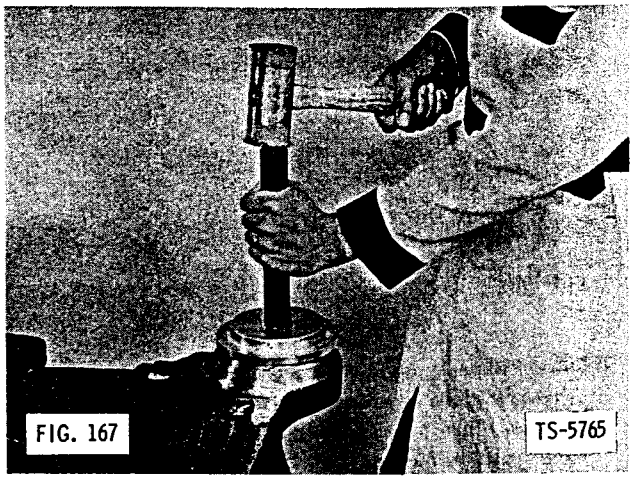


FIG. 167 TS-5765

9. Coat flange of axle shaft bearing retainer with light coat of Permatex No. 2. Position axle shaft in axle housing so that splines of shaft engage splines of differential (Fig. 168).

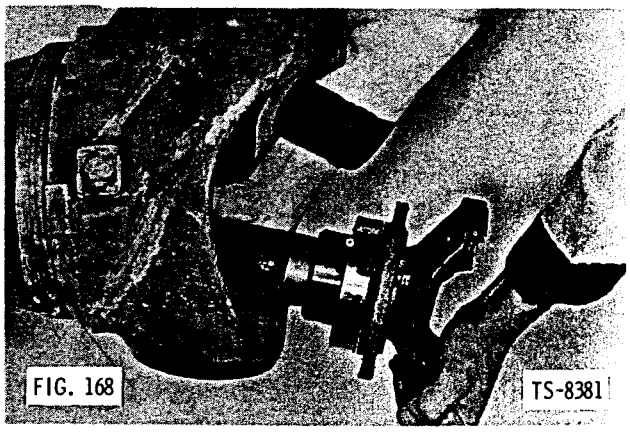


FIG. 168 TS-8381

10. Secure axle shaft bearing retainer to axle housing with six bearing retainer bolts and tighten to specified torque (Fig. 169).

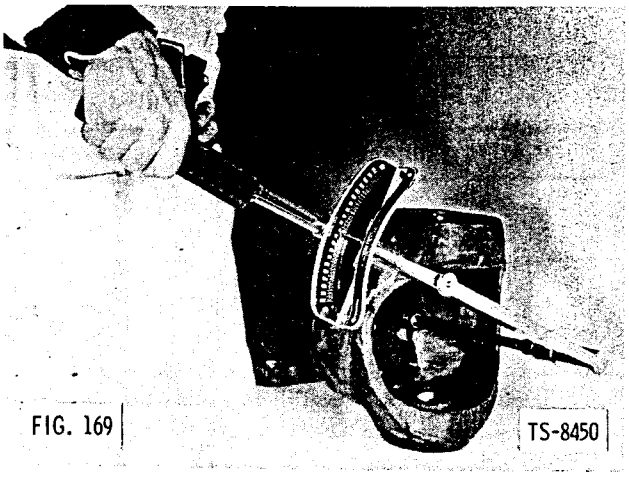


FIG. 169 TS-8450

11. Bolt U-joint to axle shaft. Tighten to specified torque (Fig. 170).

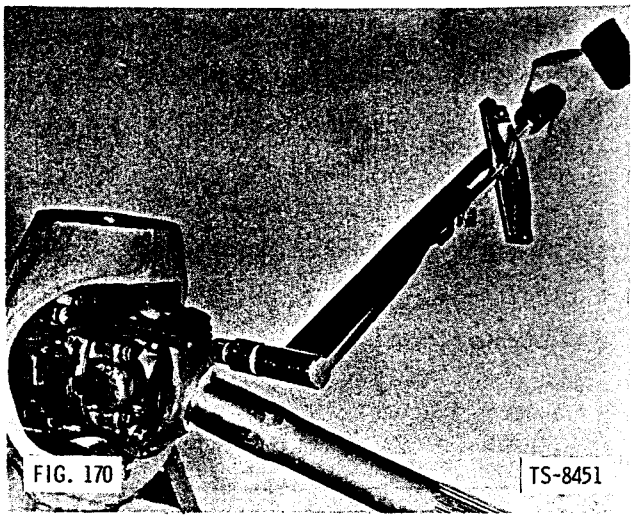


FIG. 170 TS-8451

12. Position spindle support assembly on axle housing, supporting weight of assembly with hoist (Fig. 171).


FIG. 171 TS-8377

13. Align spindle support and bearing bores of housing. Drive in lower flanged trunnion (Fig. 172) without shims. Loosely install bolts and washers, allowing at least 1/4 inch of play between bolt heads and trunnion.

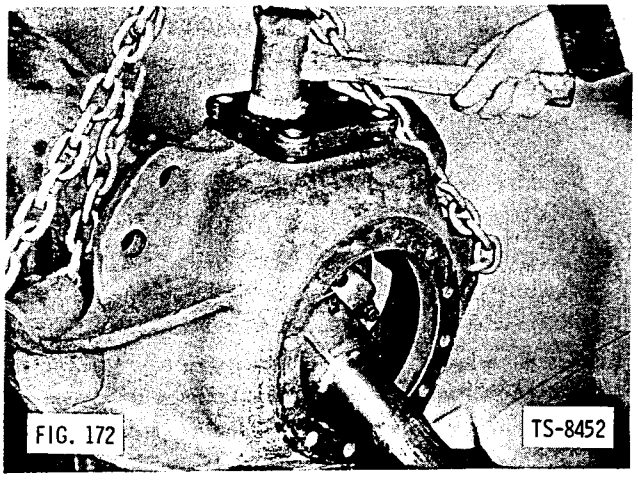


FIG. 172 TS-8452

14. Invert axle. On axles with tapered roller bearings, install one .010-inch shim over steering trunnion and cap mounting pad on spindle support. On axles with spherical cone and cup bearings, install two .020-inch shims. Drive in steering trunnion using a soft mallet (Fig. 173).

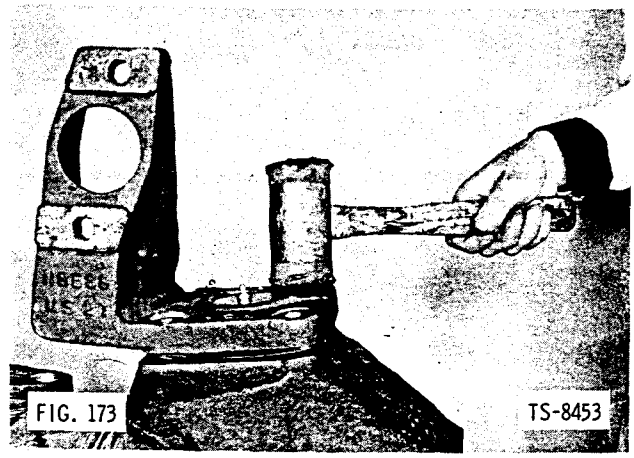


FIG. 173 TS-8453

15. Install steering trunnion cap bolts and washers. Tighten to specified torque (Fig. 174). Do not torque lower trunnion bolts.

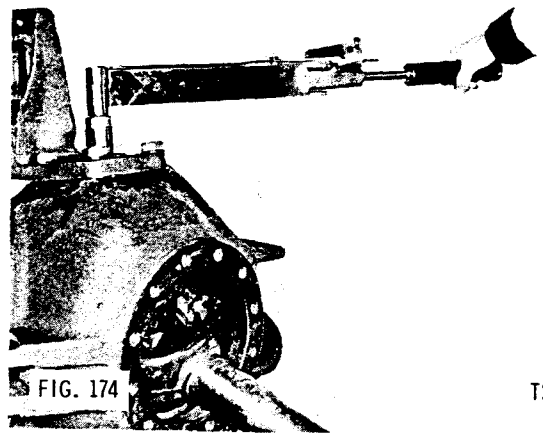


FIG. 174 TS-8454

16. Tighten lower trunnion bolts evenly in small increments until some resistance is felt when spindle support is pivoted from side to side (Fig. 175).

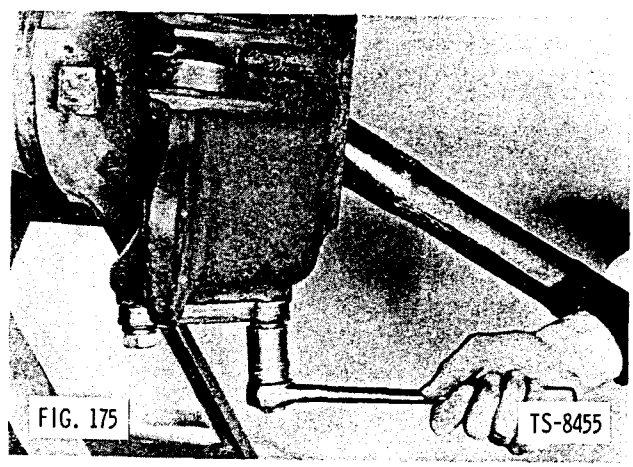


FIG. 175 TS-8455

17. Attach pound pull scale to tie rod arm on spindle support as shown in Fig. 176. Tighten bottom trunnion bolts to preload trunnion bearing until, with a steady pull, a reading of 46 to 53 pounds is obtained on scale. Read scale while spindle support is moving. Do not read pull required to start movement.

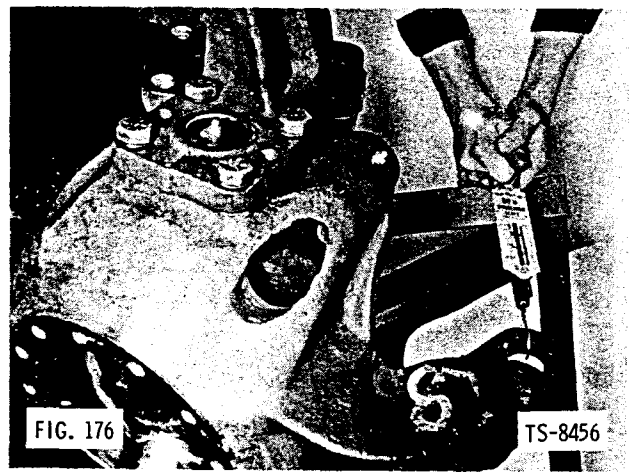


FIG. 176 TS-8456

18. Use a feeler gage to determine shim thickness required, placing the gage between the lower flange of trunnion and the spindle support (Fig. 177). Remove trunnion and add required shim thickness. Install trunnion and mounting bolts. Tighten to specified torque. Recheck preload using pull scale as shown in Fig. 176. Install puller hole plug bolts.

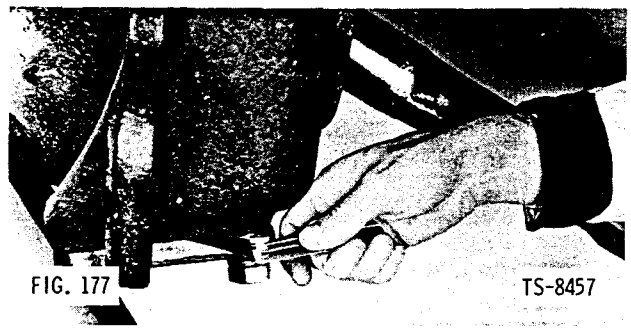


FIG. 177 TS-8457

19. Lubricate spindle bushing and lips of seal with Lubriplate. Position spindle on spindle support assembly (Fig. 178).

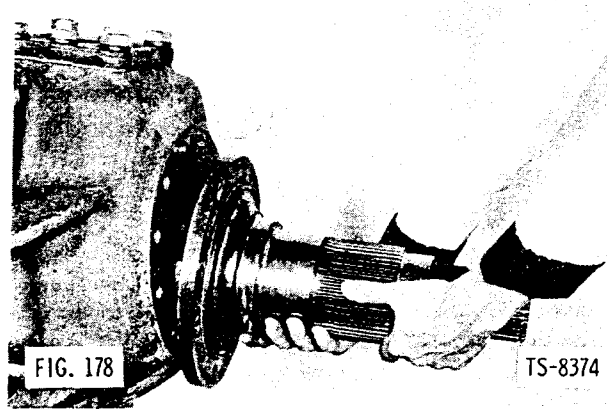


FIG. 178 TS-8374

20. Position oil catcher on brake spider. Position brake spider on spindle and spindle support so that brake camshaft hole in spider aligns with that in support (Fig. 179).

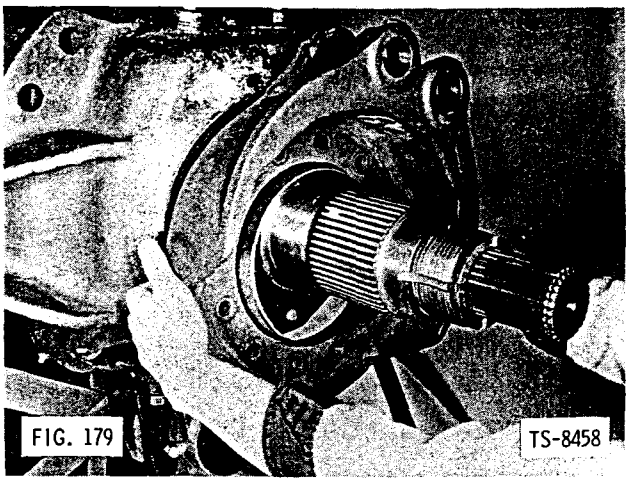


FIG. 179 TS-8458

21. Secure spindle and brake spider to spindle support with bolts and washers. Tighten to specified torque (Fig. 180).

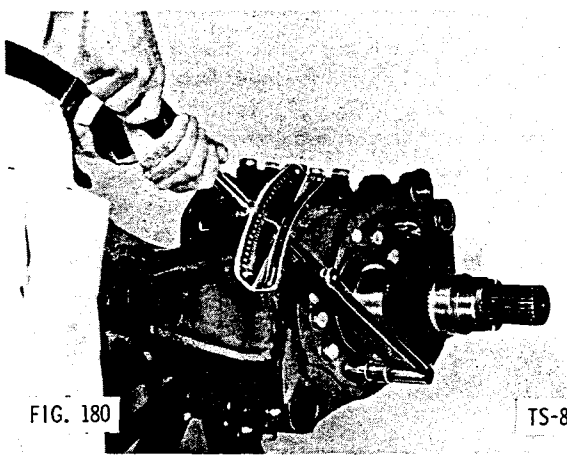


FIG. 180 TS-8459

22. Tap brake spider bushing into place in brake spider (Fig. 181).

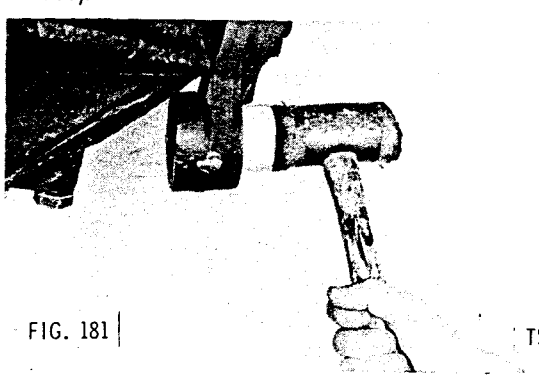


FIG. 181 TS-8460

23. Position thrust washer and "O" ring on brake camshaft. Insert camshaft through brake spider bushing and position felt grease retainer, retaining washer, and retaining ring on shaft (Fig. 182). Seat shaft fully. Install felt grease retainer in recess in spider and seat retaining ring in groove in shaft.

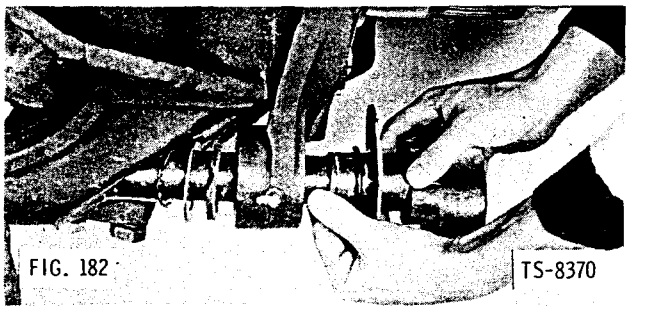


FIG. 182 TS-8370

24. Position slack adjuster on camshaft. Secure with retaining ring and washer (Fig. 183).

FIG. 183 TS-8368

25. Position air chamber on air chamber bracket (Fig. 184). Secure with nuts and lockwashers. Tighten nuts to specified torque. Secure clevis of brake chamber to slack adjuster with pin and cotter pin.

FIG. 184 TS-8367

26. Position brake shoe on spindle support. Retain brake shoe by inserting brake shoe anchor pin (Fig. 185). Install second brake shoe in same manner.

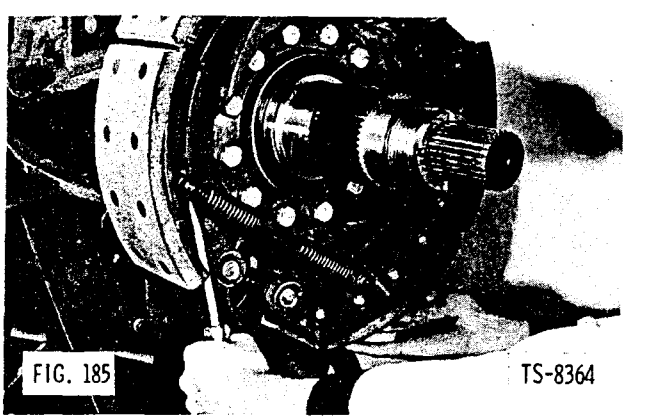


FIG. 185 TS-8364

27. Install brake shoe return spring (Fig. 186). Before installing spring, make sure that slack adjusters are adjusted to allow brake shoes to come together as closely as possible so that spring tension will be at a minimum during installation.

CAUTION: Do not use pliers with serrated jaws to assemble brake spring. Do not use any tool which will nick or score spring. This will cause early failure. Tool shown is brake pliers which has provisions on end of handle for installing spring.

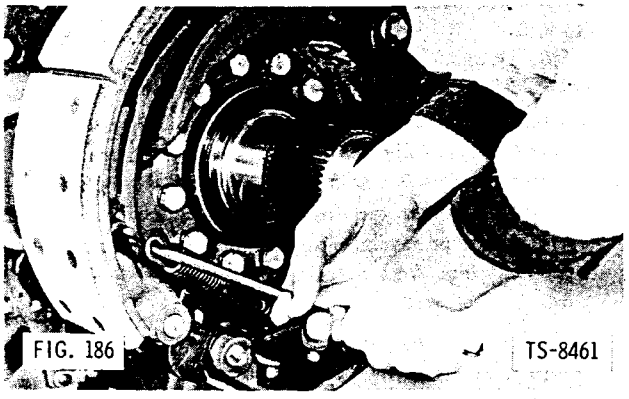


FIG. 186 TS-8461

28. Lock brake shoe anchor pins with brake pin setscrews. Lockwire setscrews (Fig. 187).

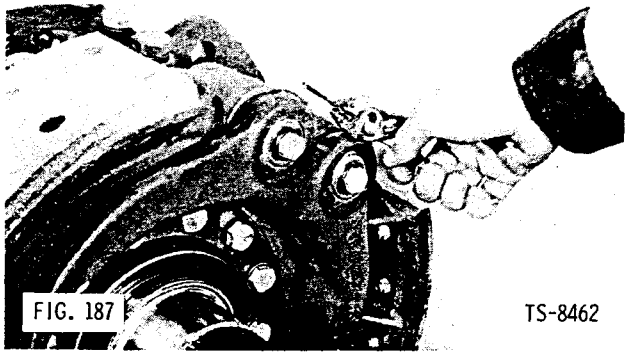


FIG. 187 TS-8462

29. Lubricate lip of hub and drum oil seal with Lubriplate. Position hub and drum on axle (Fig. 188). Care should be taken to align hub and drum assembly with spindle so that no cocking of inner hub bearing occurs when sliding assembly on spindle.

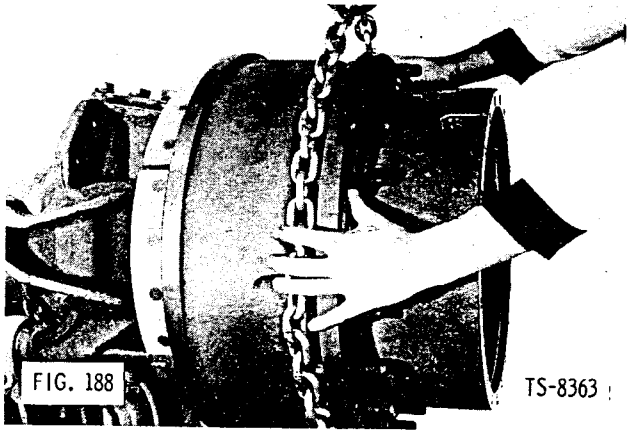


FIG. 188 TS-8363

30. Continue to support hub and drum with hoist. Position internal gear and hub on axle so that it engages splines on spindle (Fig. 189). Drive internal gear into place with soft mallet.

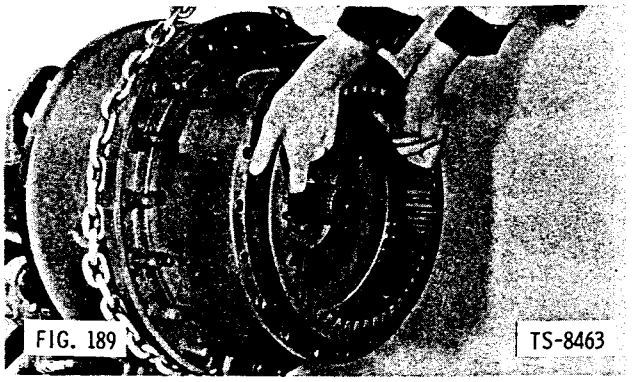


FIG. 189 TS-8463

31. Install inner spindle nut on spindle. Wrap several turns of .010- to .020-inch shim stock around splines of axle shaft to protect splines. Install spindle nut socket wrench, Part No. 945940, on nut (Fig. 190) and tighten guide bolts lightly against axle shaft.

NOTE: The tapered roller bearings utilized in wheel hub must be preloaded in accordance with procedure steps and specifications given below. One of two methods may be used in adjusting the required preload on these bearings. It should be noted that preload specification differs for use of new bearings and when wheel bearings are being reused.

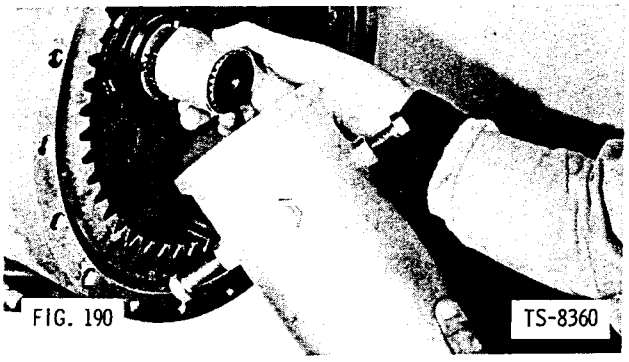


FIG. 190 TS-8360

First (Preferred) Method:

32. Tighten inner nut while rotating wheel hub in both directions until there is a slight binding (Fig. 191).

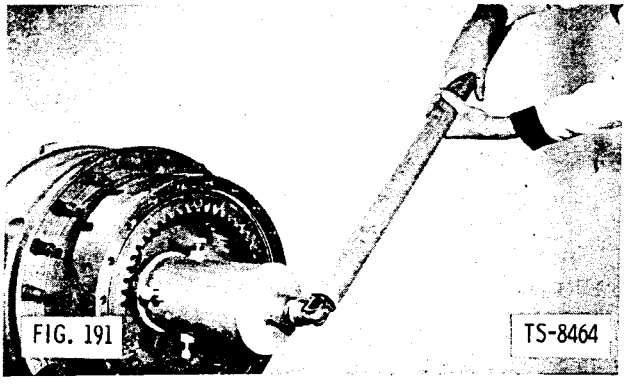
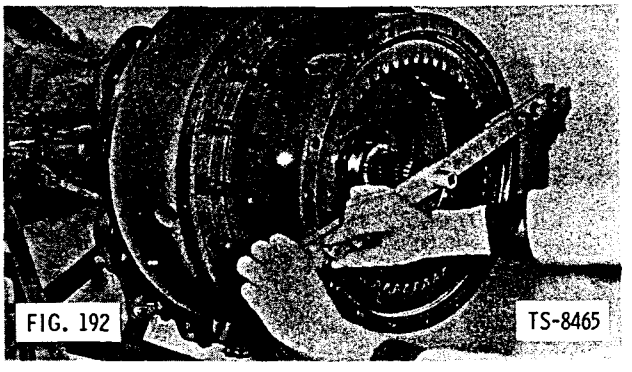


FIG. 191 TS-8464

33. Install torque wrench adapter bar, as shown in Fig. 192. The adapter bar can be fabricated locally to specifications outlined in Fig. 193. Bar illustrated will accommodate wheel hubs with planetary bolt circle diameters of 12-1/2, 16-1/2, 19-1/2, and 23 inches.



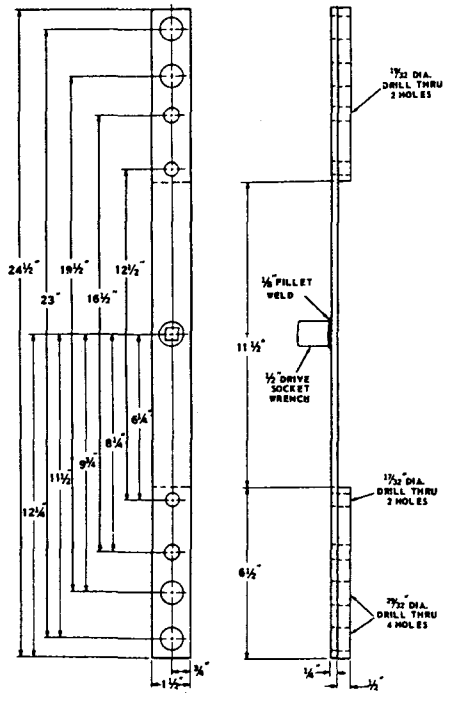
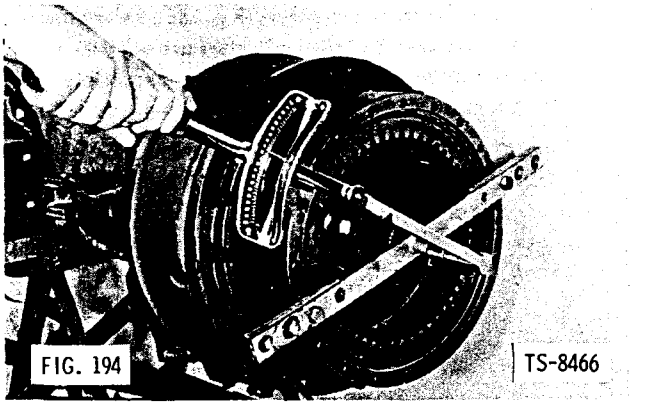


FIG. 193 TS-5623

34. Install torque wrench, 0 to 50 ft.-lb. scale, if available, and check rotating torque or rolling resistance of wheel hub (Fig. 194). Rotating torque when using new bearings should be between 15 and 20 ft.-lbs. On used bearings rotating torque should be between 6 and 12 ft. lbs.

CAUTION: Make certain wheel brake is in complete release position and that it is not dragging on brake drum.

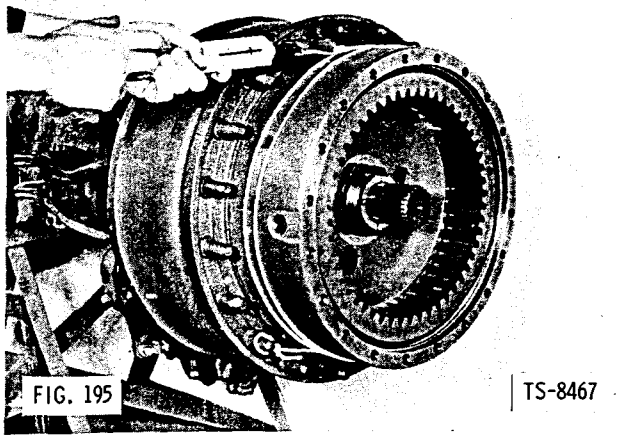


35. If rotating torque is not to specifications given above, remove adapter bar and tighten or loosen inner nut until rotating torque is within specifications. After tightening or loosening nut as required, rap wheel hub several times with plastic or rawhide faced mallet while rotating hub to seat bearings. Recheck rotating torque as indicated in step 34.

Second (Optional) Method:

36. Attach heavy string or cord to one of wheel studs on hub and wrap cord around wheel hub several times, attaching pound pull scale to end of cord as shown in Fig. 195. Tighten inner nut until rotating torque measured on pull scale is between 20 to 26 lbs. for new bearings and 8 to 16 lbs. for used bearings.

NOTE: Bearing preload rotating torque using a pound pull scale is figured by multiplying the radius (distance from center of wheel to outside diameter of wheel hub) by the reading on the pull scale and dividing by 12 to arrive at ft.-lbs. of torque. For example: Wheel hub radius of 9 inches times 23 lbs. (reading on pull scale) equals 207 in.-lbs. Dividing by 12 equals approximately 17 ft.-lbs. which is within specification of 15 to 20 ft.-lbs. rotating torque for new bearings.



37. Install nut lock and outer nut and tighten securely as shown in Fig. 188 to lock inner nut in position. Recheck rotating preload torque by one of two methods outlined above.

38. Bend two tangs of nut lock against flats on inner nut and bend two tangs against flats of outer nut (Fig. 196).

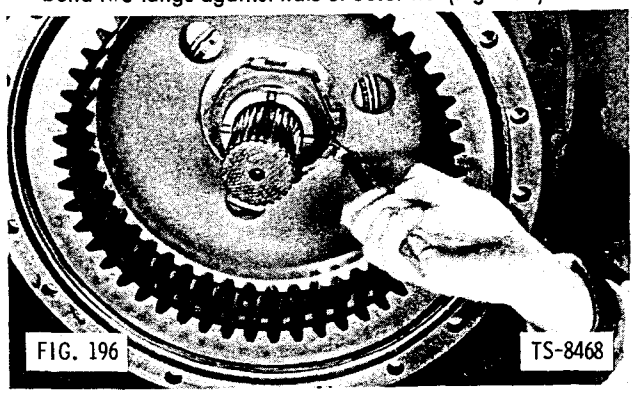


FIG. 196 TS-8468

39. Make sure "O" ring is properly installed on planet carrier. Install planet carrier assembly on hub with bolts and lockwashers. Tighten bolts to specified torque (Fig. 197).

NOTE: Earilier versions of these axles did not incorporate "O" ring feature. On these units, apply light coat of Permatex No. 2 to mounting flange of planet carrier.

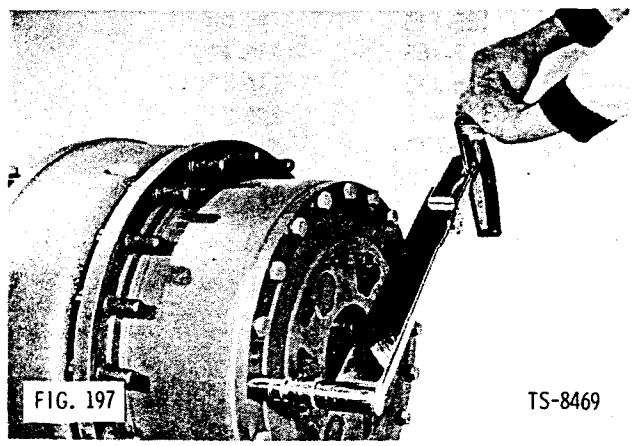


FIG. 197 TS-8469

40. Position sun gear and washer on axle shaft; secure with sun gear retaining ring (Fig. 198).

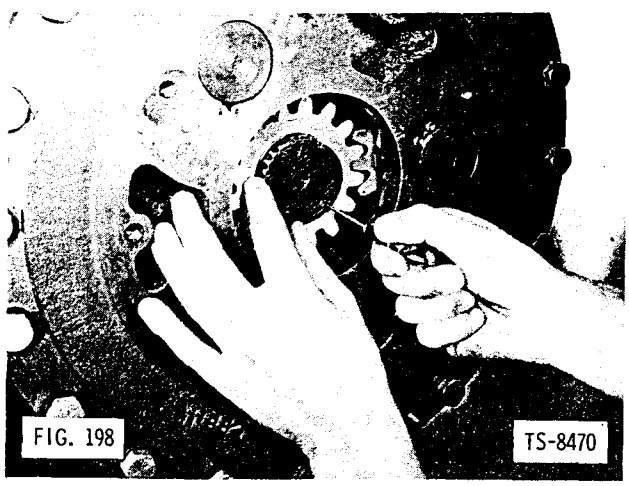


FIG. 198 TS-8470

41. Install cap-to-carrier "O" ring seal in groove in sun gear thrust cap assembly. Install thrust cap on planet carrier (Fig. 199). Make certain that "O" ring is properly positioned in the groove in the mounting face, and is not twisted. Apply light coat of Permatex No. 2 to threads of bolts and install. Tighten to specified torque.

NOTE: Early versions of these axles did not include "O" ring feature. On these units, apply light coat of Permatex No. 2 on mounting face of thrust cap before installing on planet carrier.

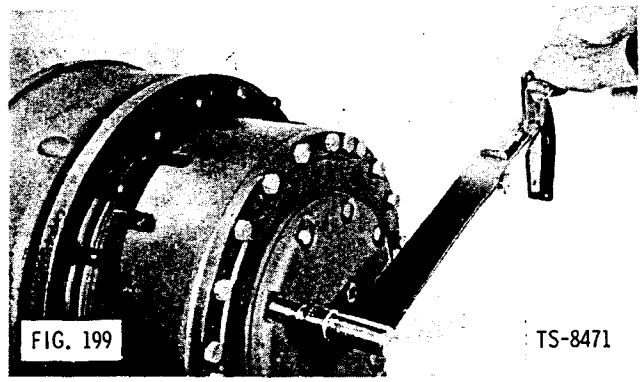


FIG. 199 TS-8471

42. Press bushings into tie rod (Fig. 200). Press only on outer race to prevent damage to bushing.

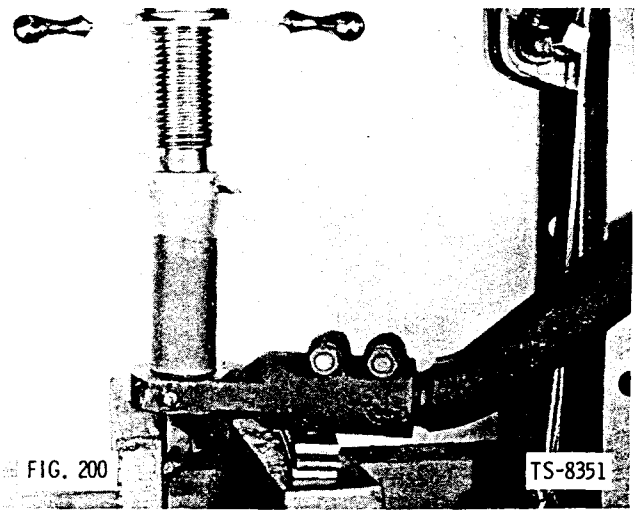


FIG. 200 TS-8351

43. Follow the same procedure as described above to assemble opposite end of axle. Install tie rod with bolt and nut. Torque nut to 300 ft.-lbs. (Fig. 201).

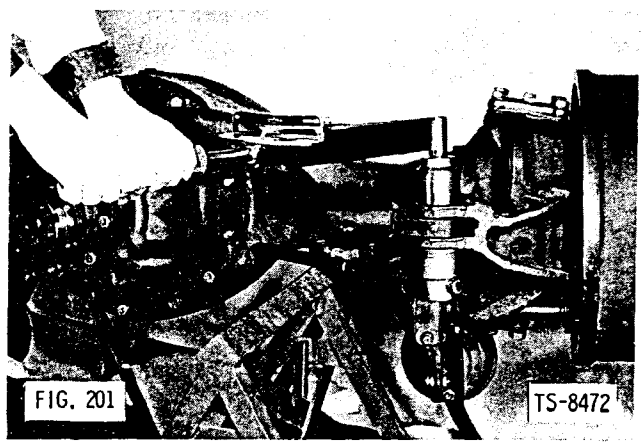


FIG. 201 TS-8472

CLARK EQUIPMENT

TABLE OF TORQUE LIMITS

COARSE THREADS	GRADE 5 DRY	GRADE 5 LUBRICATED OR PLATED	GRADE 8 DRY	GRADE 8 LUBRICATED OR PLATED
3/8 - 16	30-35	20-25	45-50	30-35
7/16 - 14	50-55	35-40	70-75	50-55
1/2 - 13	75-85	60-65	105-115	80-90
9/16 - 12	110-120	80-90	155-165	115-125
5/8 - 11	150-165	115-125	215-230	160-175
3/4 - 10	265-290	200-220	375-415	285-310
7/8 - 9	395-430	295-325	605-670	455-500
1 - 8	590-650	445-490	910-1000	685-750
1-1/8 - 7	795-875	595-655	1290-1415	965-1065
1-1/4 - 7	1120-1230	840-925	1820-2000	1360-1495
FINE THREADS				
3/8 - 24	35-40	25-30	50-55	35-40
7/16 - 20	55-60	40-45	80-85	60-65
1/2 - 20	85-95	65-70	120-130	90-100
9/16 - 18	120-130	90-100	175-185	130-140
5/8 - 18	170-185	130-140	240-260	180-200
3/4 - 16	300-325	225-245	420-460	315-345
7/8 - 14	435-475	325-360	670-735	500-550
1 - 12	645-710	485-535	995-1095	745-820
1-1/8 - 12	890-980	670-735	1445-1590	1085-1190
1-1/4 - 12	1240-1365	930-1025	2015-2215	1510-1660