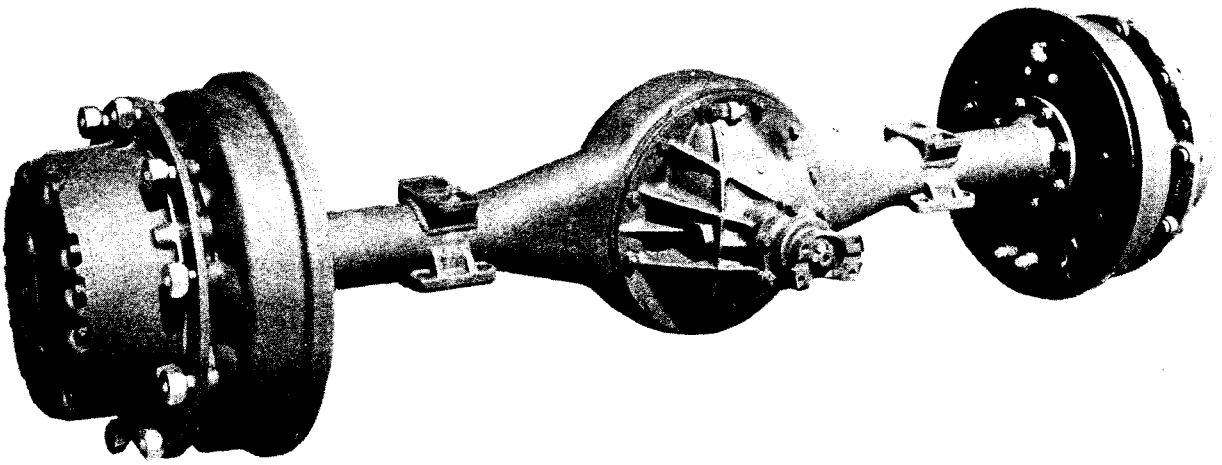
CLARK

AXLE

MAINTENANCE & SERVICE MANUAL



13500 SERIES DRIVE AXLE

CLARK EQUIPMENT COMPANY

CUSTOMER SERVICE DIVISION

PUBLICATION DEPT. — JACKSON, MICHIGAN

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D13500 5-72

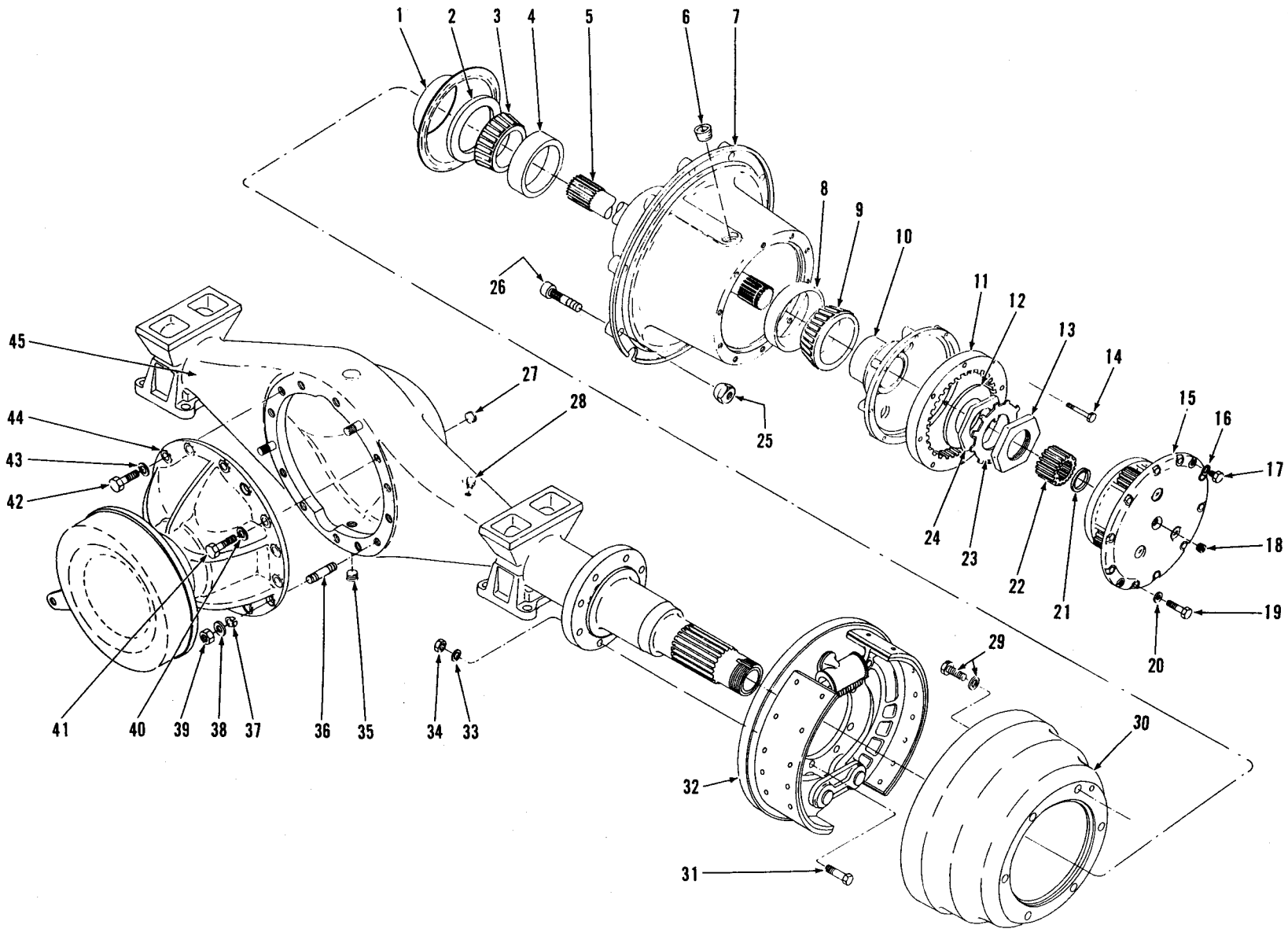


FIG. A

FIG. A - DRIVE AXLE ASSEMBLY

TS-3625

DRIVE AXLE ASSEMBLY

Item No.	Description	No. Req'd.
1	SLINGER, Oil	2
2	SEAL, Hub Oil	2
3	CONE, Inner Hub Bearing	2
4	CUP, Inner Hub Bearing	2
5	SHAFT, Axle	2
6	PLUG, Hub Filler & Drain	2
7	HUB ASSEMBLY	2
8	CUP, Outer Hub Bearing	2
9	CONE, Outer Hub Bearing	2
10	HUB, Internal Gear	2
11	GEAR, Internal	2
12	WASHER, Spindle Thrust	2
13	NUT, Outer Spindle	2
14	BOLT, Internal Gear to Hub	2
15	PLANET SPIDER ASSEMBLY	2
16	LOCKWASHER, Puller Hole Bolt	4
17	BOLT, Puller Hole	4
18	PLUG, Planet Spider	2
19	BOLT, Planet Spider to Hub	20
20	WASHER, Planet Spider to Hub	20
21	RING, Sun Gear Retaining	2
22	GEAR, Sun	2
23	LOCK, Spindle Nut	2
24	NUT, Inner Spindle	2
25	NUT, Wheel	20
26	BOLT, Wheel	20
27	PLUG, Housing Filler	1
28	BREATHER, Axle Housing	1
29	BOLT AND WASHER, Drum to Hub	12
30	DRUM, Brake	2
31	BOLT, Brake Attaching	16
32	BRAKE ASSEMBLY	2
33	LOCKWASHER, Brake Attaching	16
34	NUT, Brake Attaching	16
35	PLUG, Housing Drain	1
36	STUD, Carrier to Housing	3
37	DOWEL, Carrier to Housing Stud	3
38	WASHER, Carrier to Housing Stud	3
39	NUT, Carrier to Housing Stud	3
40	WASHER, Carrier to Housing Bolt	2
41	BOLT, Carrier to Housing	2
42	BOLT, Carrier to Housing	7
43	WASHER, Carrier to Housing Bolt	7
44	DIFFERENTIAL & CARRIER ASSEMBLY	1
45	HOUSING, Axle	1

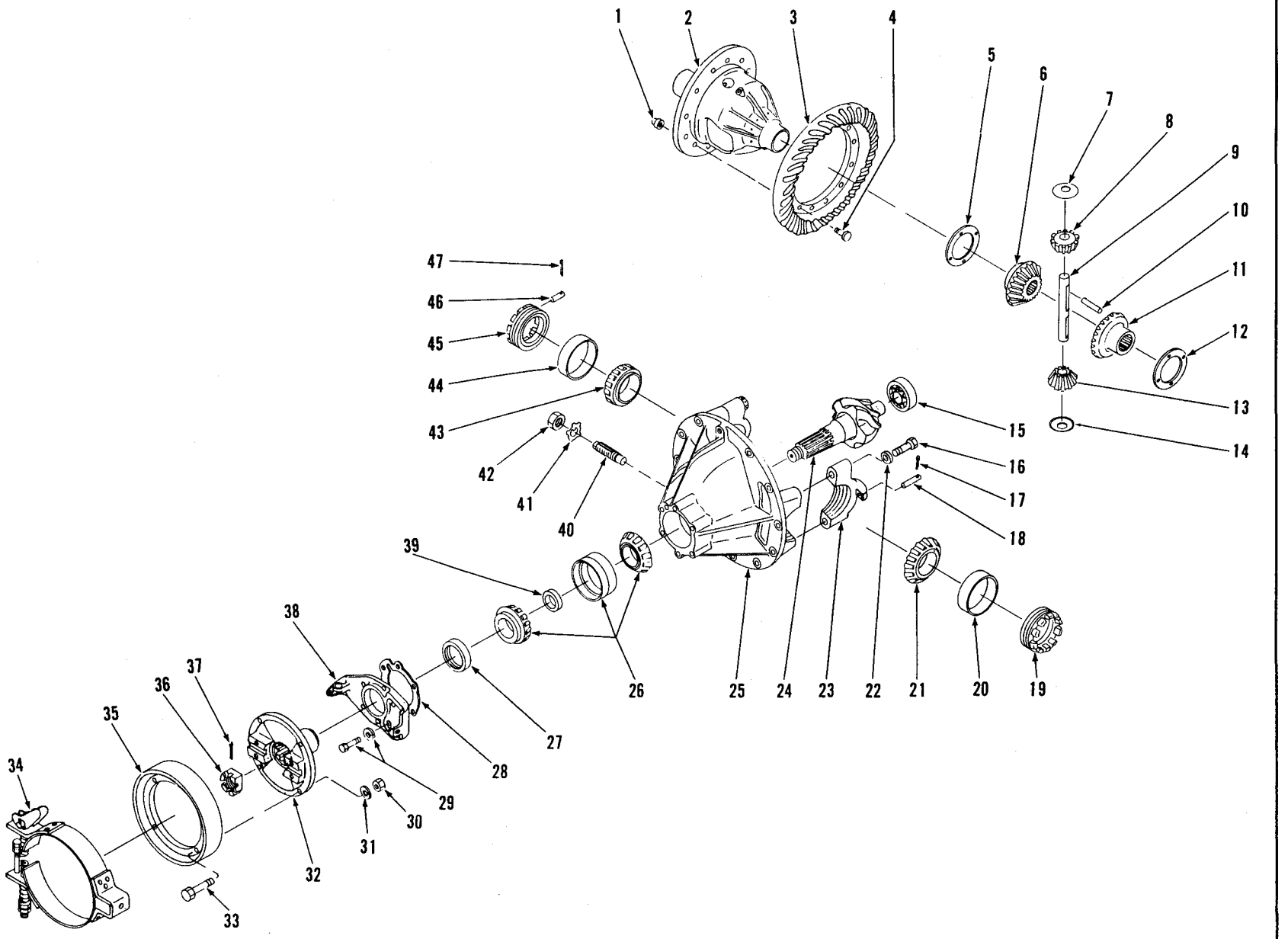


FIG. B

FIG. B - DIFFERENTIAL AND CARRIER ASSEMBLY

TS-3583

DIFFERENTIAL AND CARRIER ASSEMBLY

Item No.	Description	No. Req'd.
1	NUT, Ring Gear Bolt	12
2	CASE, Differential	1
3	RING GEAR	1
4	BOLT, Ring Gear	12
5	WASHER, Side Gear Thrust	1
6	GEAR, Differential Side	1
7	WASHER, Pinion Thrust	1
8	PINION, Differential	1
9	PIN, Differential Pinion	1
10	PIN, Differential Pinion Pin Lock	1
11	GEAR, Differential Side	1
12	WASHER, Side Gear Thrust	1
13	PINION, Differential Side	1
14	WASHER, Differential Pinion Thrust	1
15	BEARING, Inner Pinion	1
16	BOLT, Differential Carrier Cap	4
17	COTTER, Adjusting Nut Lock Pin	2
18	PIN, Differential Adjusting Nut Lock	2
19	NUT, Differential Adjusting	1
20	CUP, Differential Bearing	1
21	CONE, Differential Bearing	1
22	WASHER, Carrier Cap Bolt	4
23	CAP, Differential Carrier	2
24	PINION, Differential	1
25	CARRIER ASSEMBLY, Differential	1
26	BEARING ASSEMBLY, Pinion	1
27	SEAL, Pinion Oil	1
28	GASKET, Bearing Retainer	1
29	BOLT AND LOCKWASHER, Bearing Retainer	6
30	NUT, Brake Drum to Flange	4
31	LOCKWASHER, Brake Drum to Flange	4
32	FLANGE, Companion	1
33	BOLT, Brake Drum to Flange	4
34	PARKING BRAKE	1
35	DRUM, Parking Brake	1
36	NUT, Pinion Shaft	1
37	COTTER, Pinion Shaft Nut	1
38	BRACKET, Pinion Bearing Retaining	1
39	SPACER, Pinion Bearing	1
40	SCREW, Differential Thrust	1
41	LOCK, Thrust Screw Nut	1
42	NUT, Thrust Screw	1
43	CONE, Differential Bearing	1
44	CUP, Differential Bearing	1
45	NUT, Differential Adjusting	1
46	PIN, Differential Adjusting Nut Lock	1
47	COTTER, Adjusting Nut Lock Pin	1

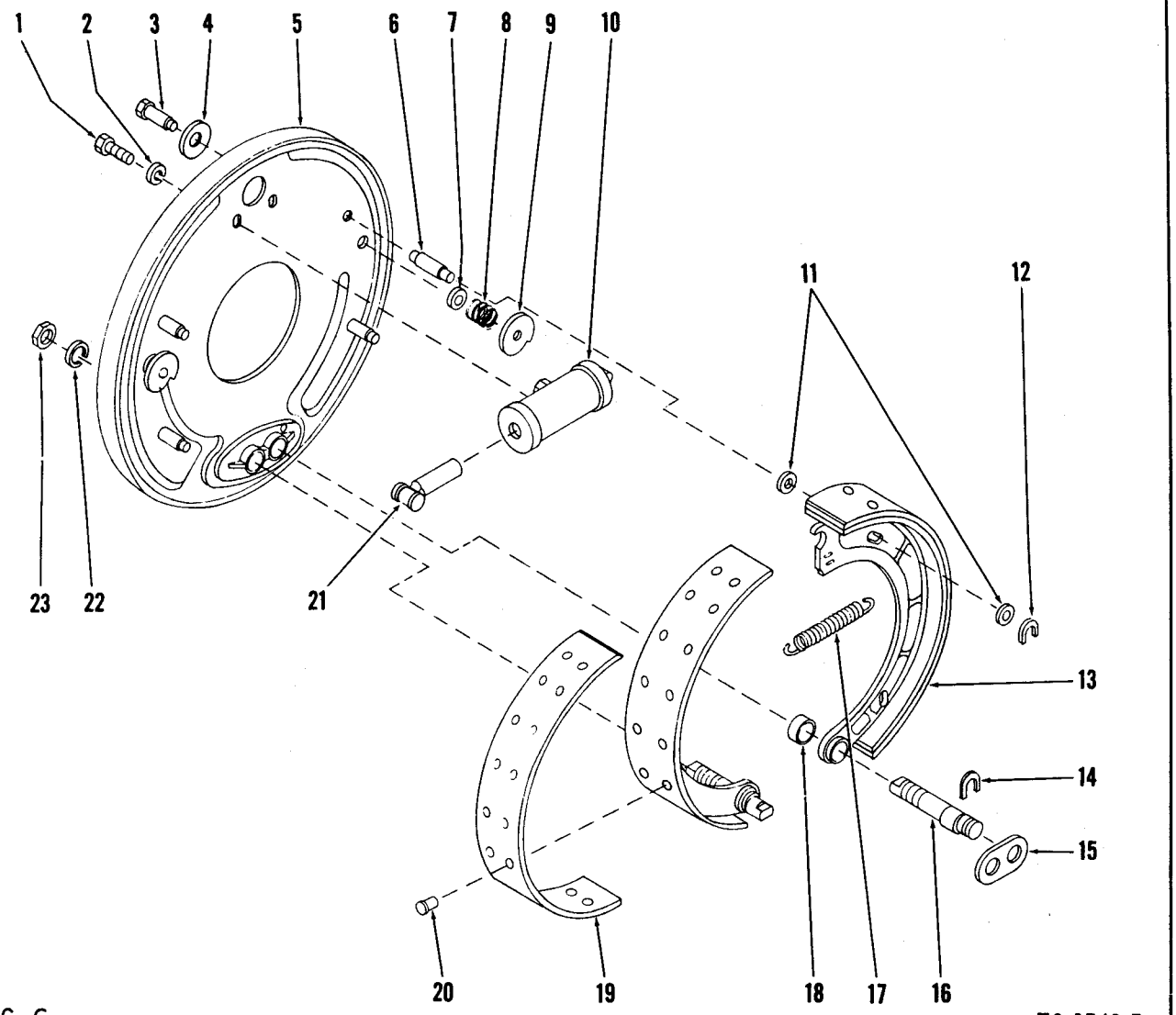


FIG. C TS-1743-P

SERVICE BRAKE ASSEMBLY

Item No.	Description	No. Req'd.
1	BOLT, Cylinder to Brake Disc	2
2	LOCKWASHER, Cylinder to Brake Disc	2
3	PIN, Cam	2
4	WASHER, Cam Pin	2
5	DISC ASSEMBLY, Brake	1
6	PIN, Guide	4
7	WASHER, Cam Spring	2
8	SPRING, Cam	2
9	CAM, Brake Shoe Adjusting	2
10	CYLINDER, Wheel	1
11	WASHER, Guide Pin	8
12	"C" WASHER, Guide Pin	4
13	SHOE ASSEMBLY, Brake	2
14	"C" WASHER, Anchor Pin	2
15	STRUT, Anchor Pin	1
16	PIN, Anchor	2
17	SPRING, Brake Shoe Return	1
18	BUSHING, Brake Shoe	2
19	LINING KIT, Brake Shoe	2
20	RIVET, Lining to Shoe	36
21	LINK, Wheel Cylinder Connector	2
22	LOCKWASHER, Anchor Pin	2
23	NUT, Anchor Pin	2

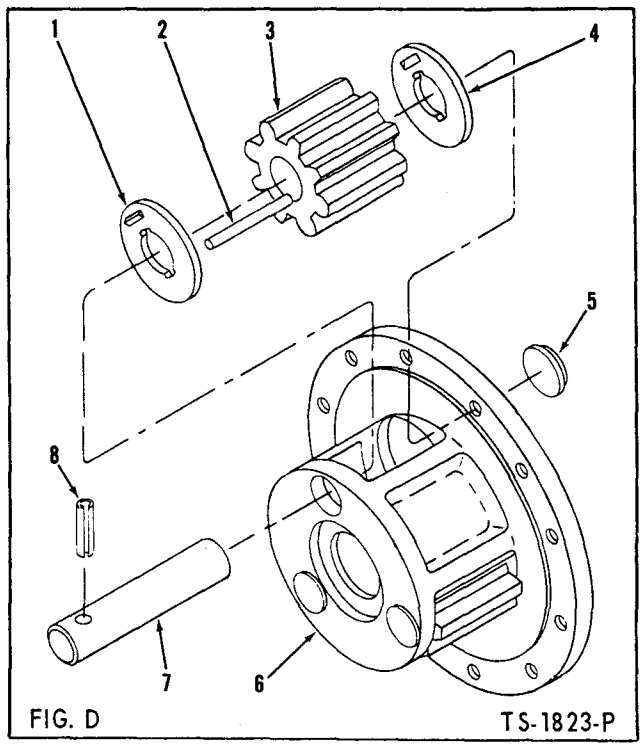


FIG. D TS-1823-P

PLANET SPIDER ASSEMBLY

Item No.	Description	No. Req'd.
1	WASHER, Pinion Thrust	3
2	ROLLER, Pinion Needle	102
3	PINION, Planet	3
4	WASHER, Pinion Thrust	3
5	PLUG, Planet Expansion	3
6	SPIDER, Planet	1
7	SHAFT, Pinion	3
8	PIN, Pinion Shaft Lock	3

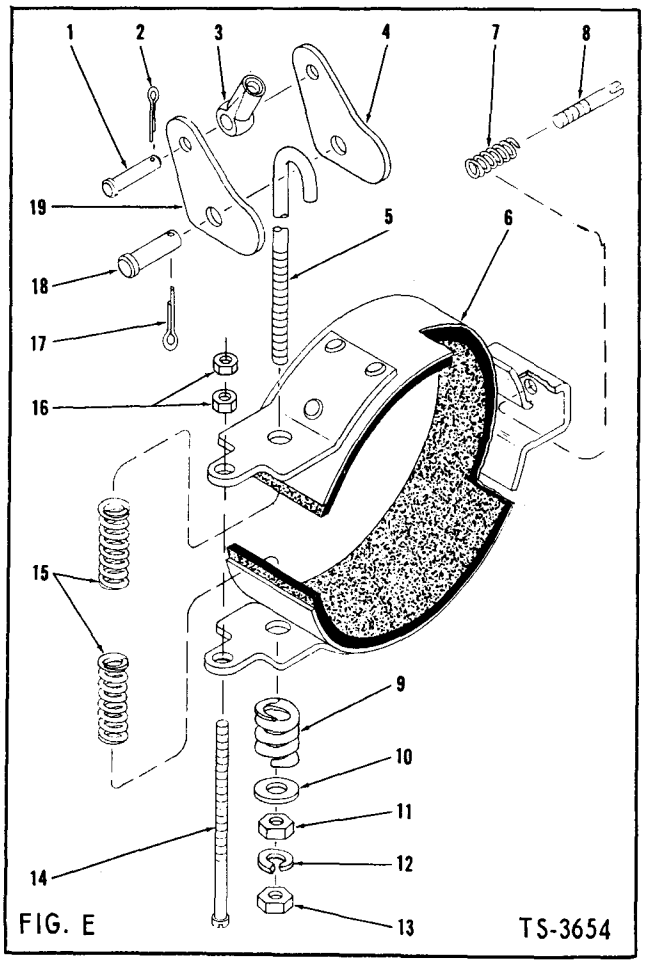


FIG. E TS-3654

PARKING BRAKE ASSEMBLY

Item No.	Description	No. Req'd.
1	PIN, Draw Rod Clevis	1
2	COTTER, Clevis Pin	1
3	END, Adjusting	1
4	LEVER, Cam	1
5	BOLT, Adjusting	1
6	BAND & LINING ASSEMBLY, Brake	1
7	SPRING, Anchor Clip	1
8	SCREW, Anchor Clip Adjusting	1
9	SPRING, Compression	1
10	WASHER, Compression Spring	1
11	NUT, Adjusting Bolt	1
12	LOCKWASHER, Adjusting Bolt	1
13	NUT, Adjusting Bolt	1
14	SCREW, Locating	1
15	SPRING, Brake Release	2
16	NUT, Locating Screw	2
17	COTTER, Clevis Pin	1
18	PIN, Cam Lever Clevis	1
19	LEVER, Cam	1

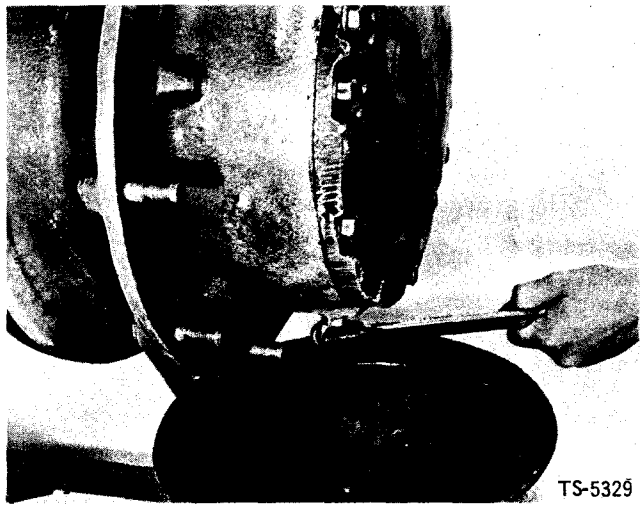
OVERHAUL OF AXLE ASSEMBLY

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.

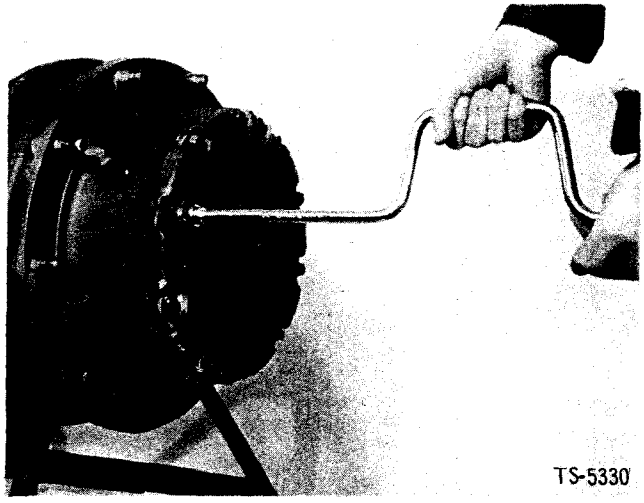
CAUTION: Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

DISASSEMBLY OF AXLE

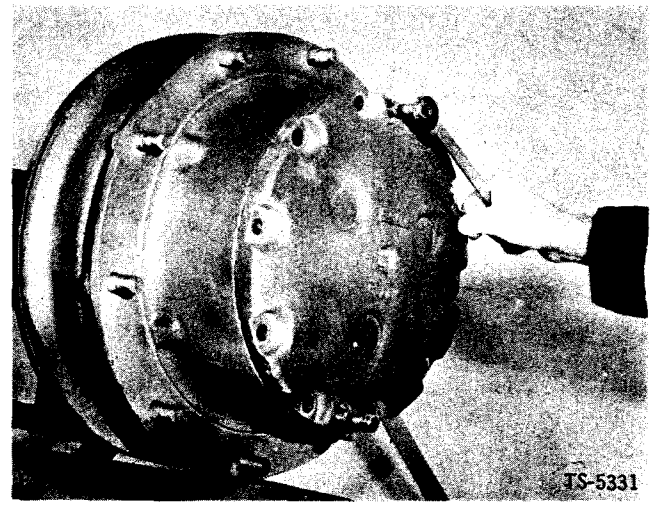
1. Remove drain plugs from planetary housings and from differential housing to drain axle (Fig. 1).


TS-5329

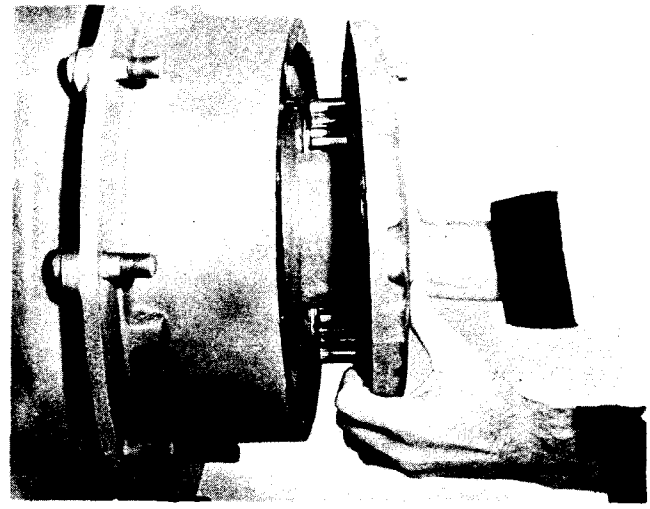
2. Remove mounting bolts and flat washers securing planet spider assembly to hub assembly. Remove two short puller hole bolts (Fig. 2).


TS-5330

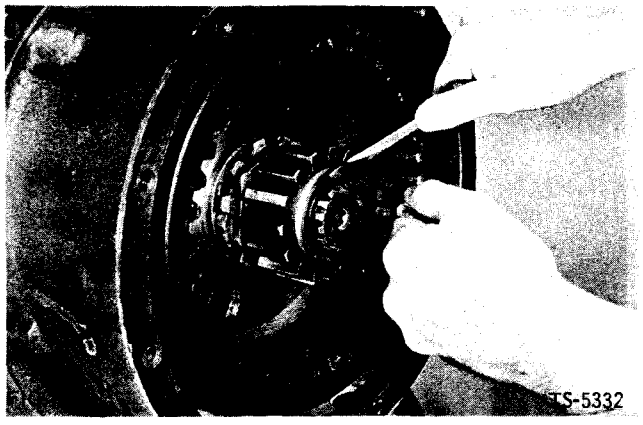
3. Install two mounting bolts in puller holes and turn in bolts to pull planet spider assembly from hub assembly (Fig. 3).


TS-5331

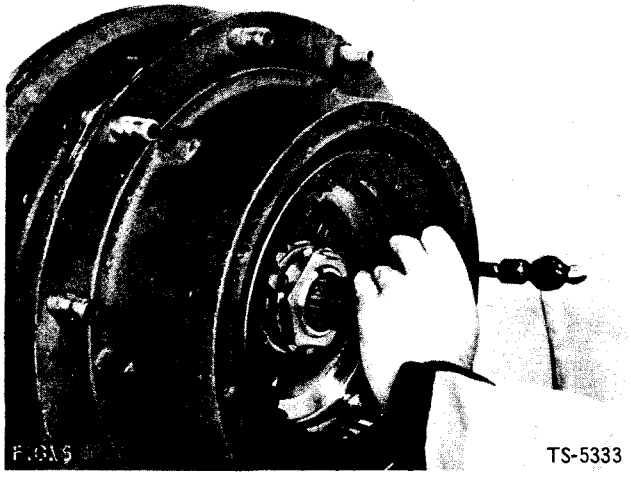
4. Remove planet spider assembly (Fig. 4).



5. Remove retaining ring securing sun gear to end of axle shaft. To remove retaining ring, pry it out of groove with small screwdriver or pointed tool while prying off with larger screwdriver (Fig. 5). Remove sun gear.


TS-5332

6. Straighten tangs on nut lock as shown in Fig. 6.


TS-5333

7. Remove nut, nut lock, second nut, and thrust washer from spindle assembly (Fig 7).

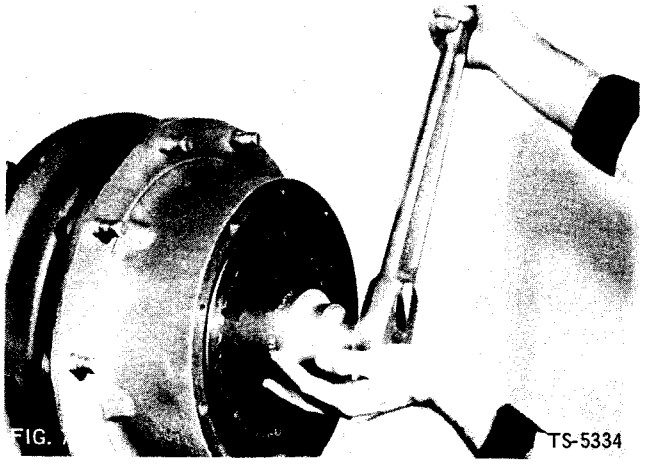
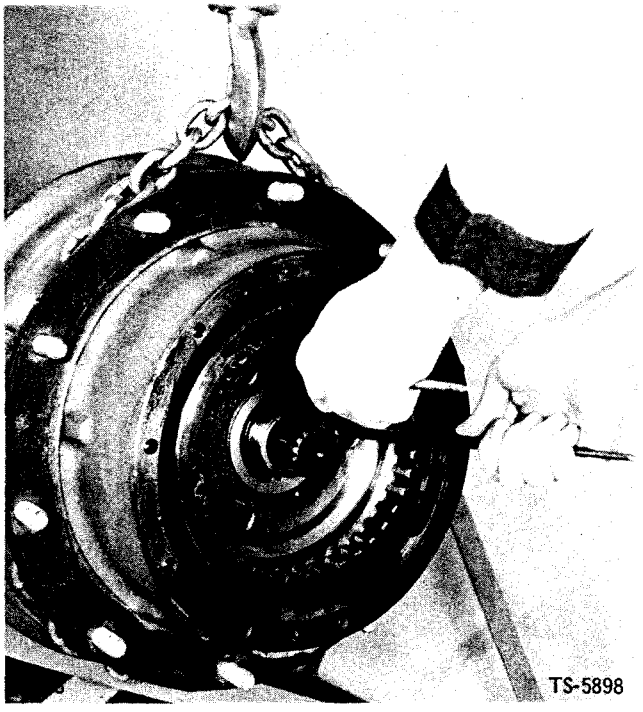


FIG. 7 TS-5334

8. Support weight of brake drum and hub assembly with hoist. Use pry bars to remove internal gear and hub from spindle (Fig. 8).


TS-5898

9. If bearing cone on internal gear and hub requires replacement, use suitable puller to remove (Fig. 9).

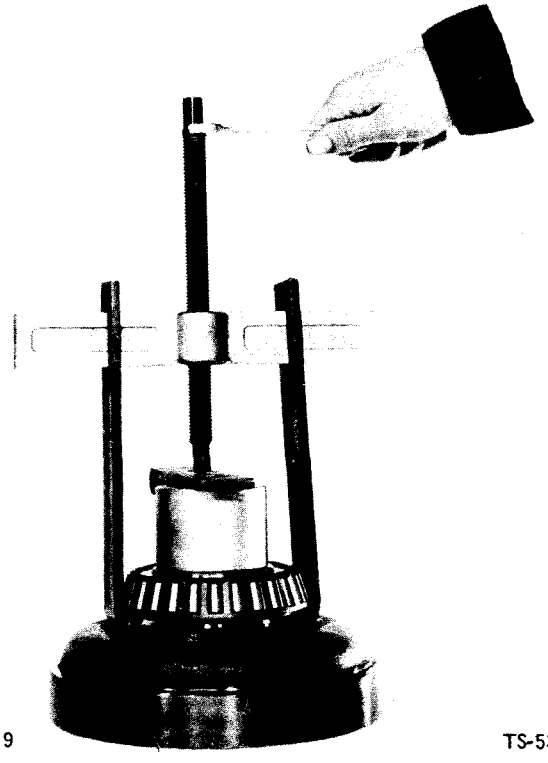


FIG. 9 TS-5336

10. Pull straight out on brake drum and hub assembly to remove it from axle (Fig. 10).

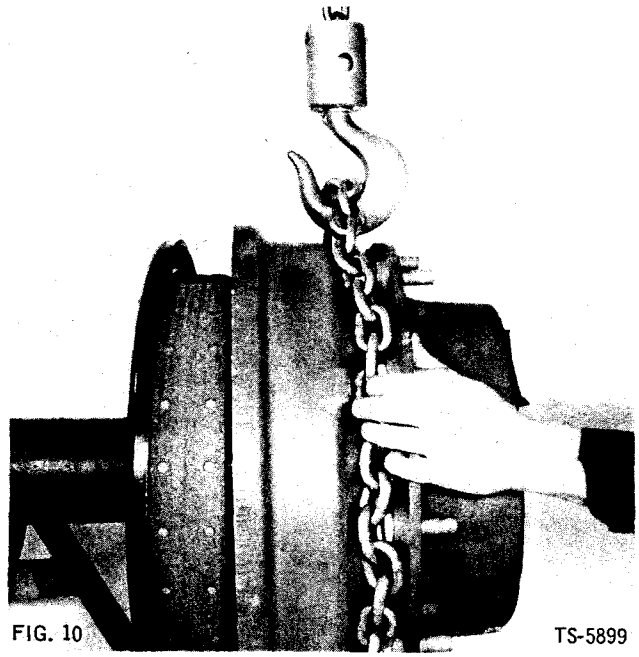


FIG. 10 TS-5899

11. Remove bolts, nuts, and lockwashers securing brake assembly to axle housing (Fig. 11).

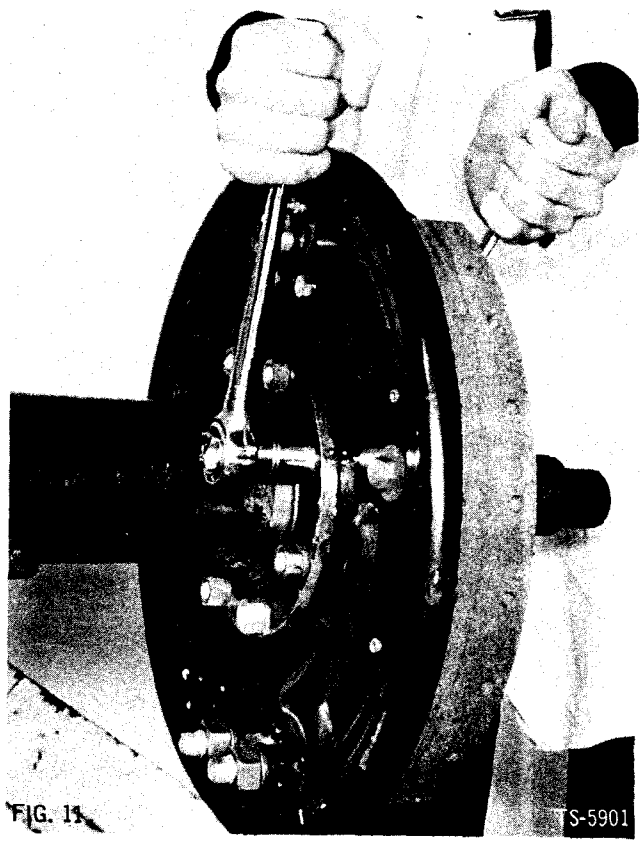


FIG. 11 TS-5901

12. Remove brake assembly from axle housing (Fig. 12).

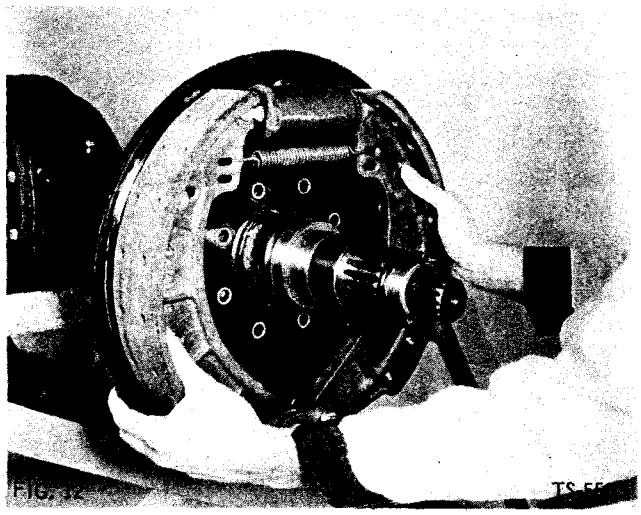


FIG. 12 TS-5

13. Pull straight out on axle shaft to remove it (Fig. 13).

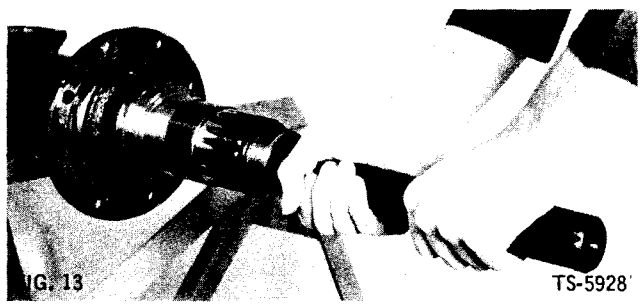


FIG. 13 TS-5928

14. Support weight of differential with hoist. Remove bolts, stud nuts and washers securing differential to axle housing (Fig. 14).

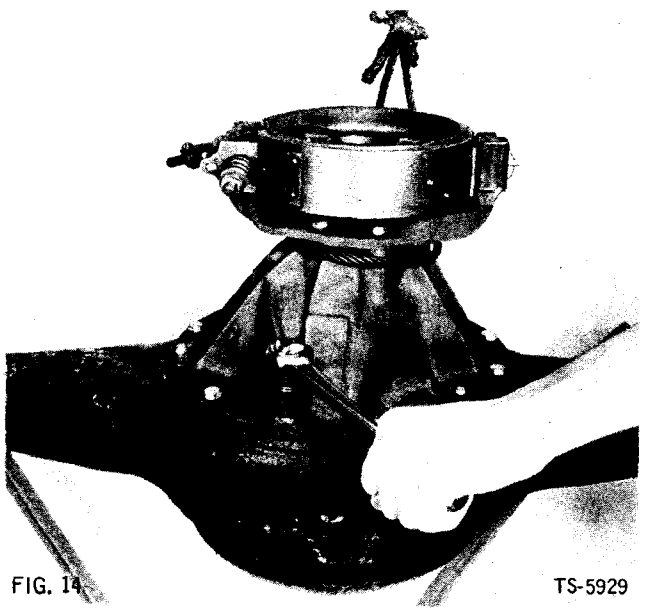


FIG. 14 TS-5929

15. Carefully hoist differential from axle housing. (Fig. 15). If necessary, tap differential housing with soft hammer to break loose joint between parts.

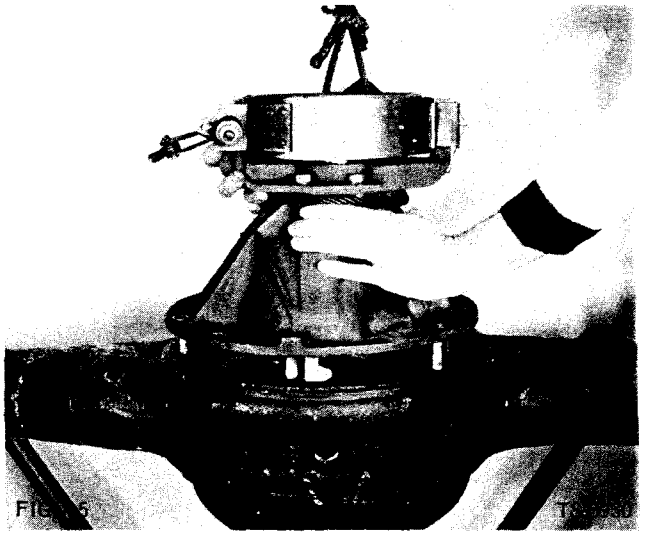


FIG. 15 TS-5360

Disassembly of Planet Spider Assembly

1. Tap out roll pin securing pinion shaft to planet spider. (Fig. 16).

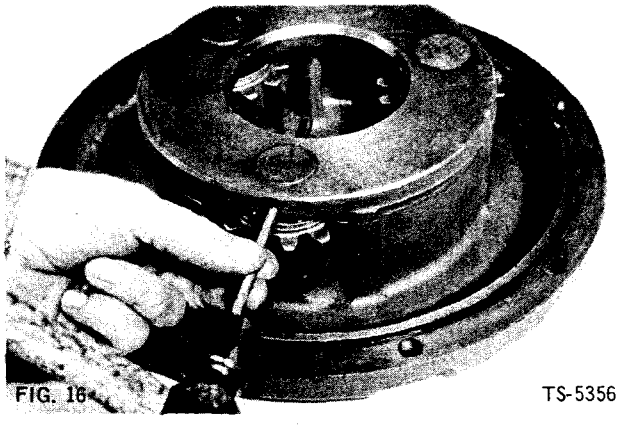


FIG. 16 TS-5356

2. Position planet spider assembly in soft-jawed vise and drive out pinion shaft. Drive from inside of spider to dislodge expansion plug (Fig. 17).

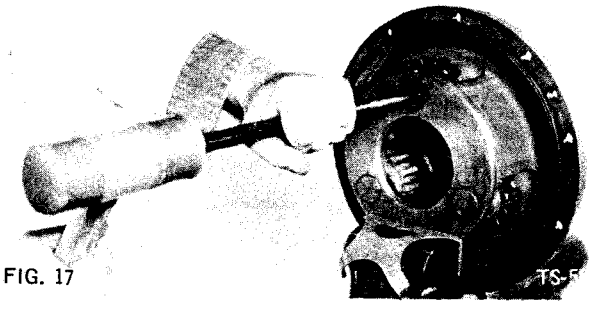


FIG. 17 TS-5

3. Remove thrust washer, pinion, and pinion needle rollers as they are released by removal of shaft (Fig. 18). Take care not to lose rollers.

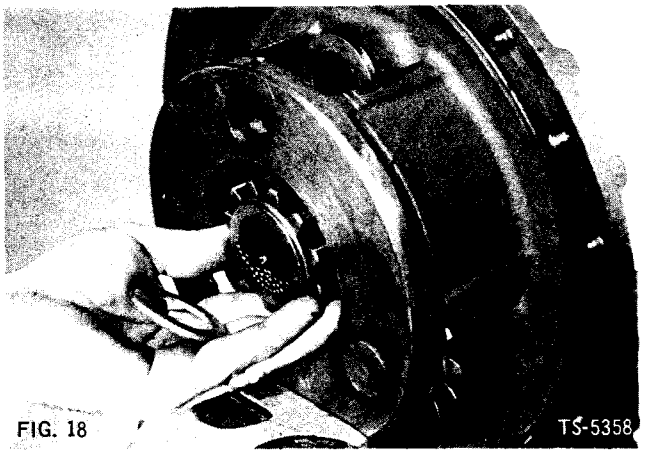


FIG. 18 TS-5358

Disassembly of Hub and Drum Assembly

1. Match mark hub and drum to assure that parts will be reassembled in proper position (Fig. 19).

   NOTE: If replacement of oil seal and/or bearings only is required, steps 1 and 2 may be omitted.

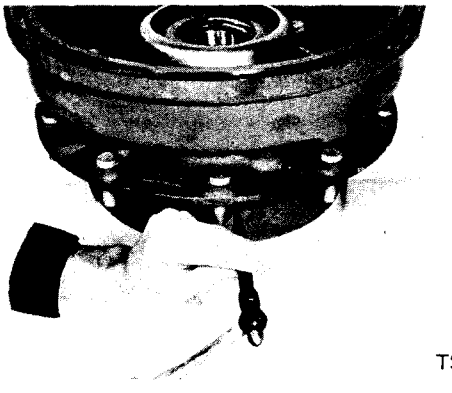


FIG. 19 TS-5931

2. Cut lockwires and remove bolts and flat washers securing brake drum to hub (Fig. 20). Remove drum and oil slinger.

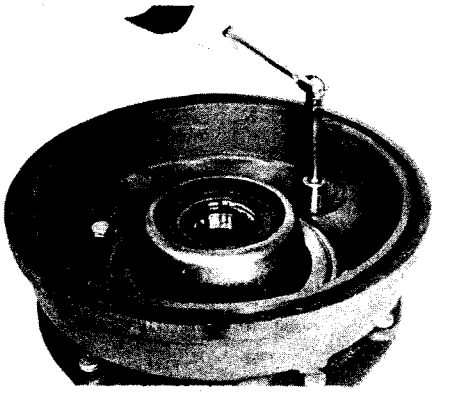


FIG. 20 TS-5932

3. Pry out oil seal (Fig. 21).

FIG. 21

4. Lift out bearing cone (Fig. 22).

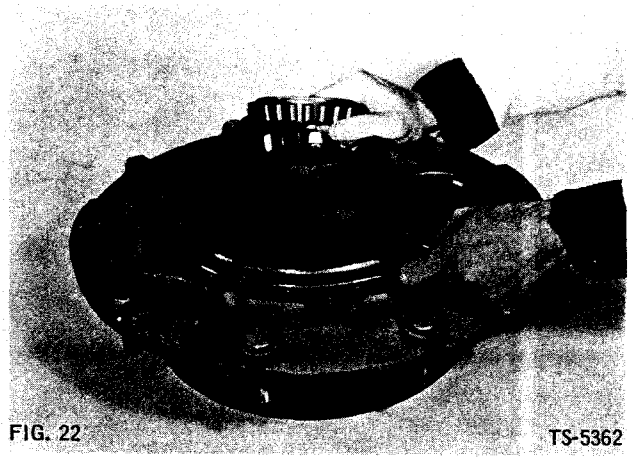


FIG. 22 TS-5362

5. If inner bearing cup is damaged, invert hub and drive out cup using drift (Fig. 23). Exercise care to prevent damage to bearing bores when removing bearing cups.

FIG. 23 TS-5363

6. If outer bearing cup is damaged, again invert hub and drive out cup using drift (Fig. 24). Exercise care to prevent damage to bearing bores when removing bearing cups.

FIG. 24 TS-5364

7. If any wheel bolts are damaged, drive out all wheel bolts and replace the entire set with new bolts (Fig. 25). DO NOT replace single bolts; always replace entire set.

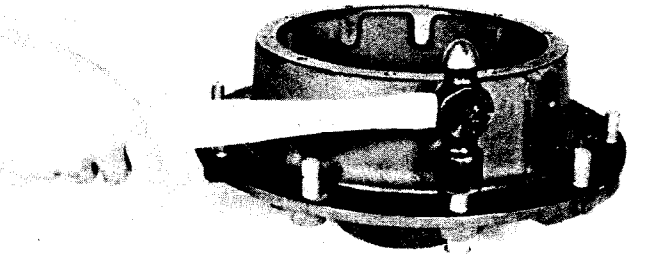


FIG. 25 TS-5933

Disassembly of Brake Assembly

1. Rotate brake shoe adjusting cams so that brake spring tension is at a minimum (Fig. 26).

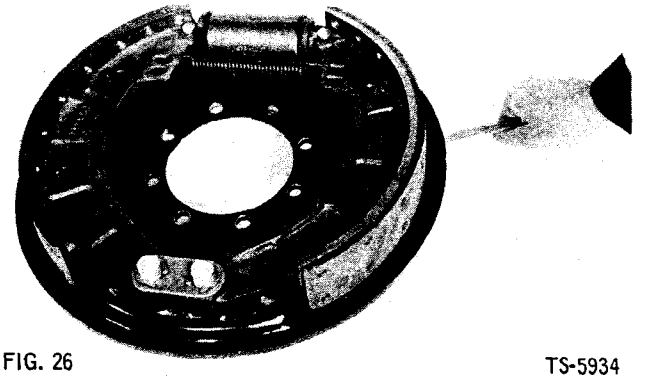


FIG. 26 TS-5934

2. Use brake spring pliers to remove brake spring (Fig. 27).

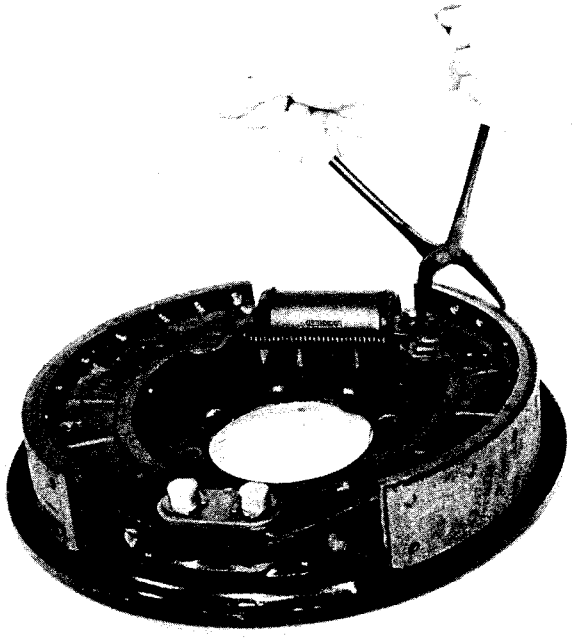


FIG. 27 TS-5935

3. Drive off small brake shoe "C" washers and remove guide pin washers (Fig. 28).

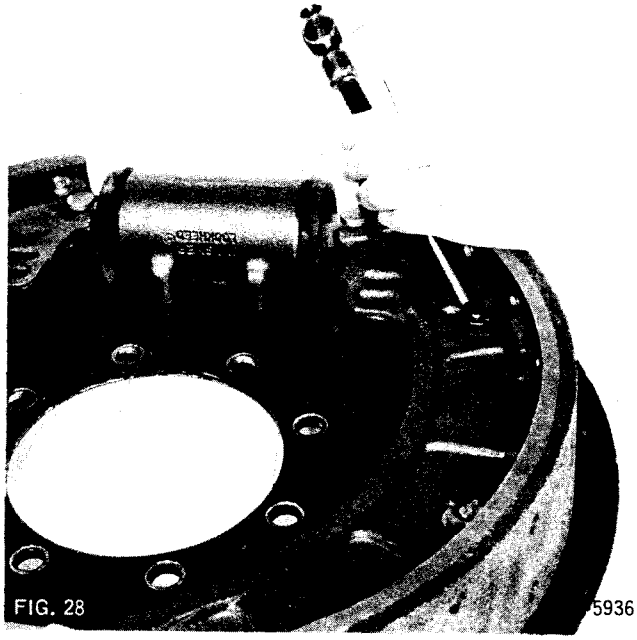


FIG. 28 5936

4. Pry off anchor pin "C" washers (Fig. 29).

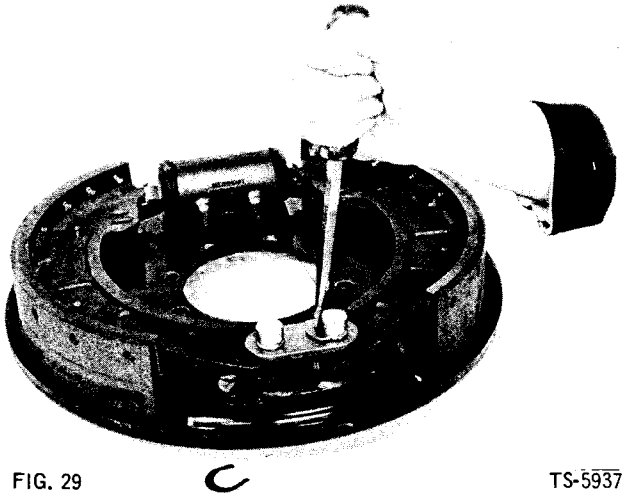


FIG. 29 TS-5937

5. Remove strut and lift off brake shoe assemblies (Fig. 30).

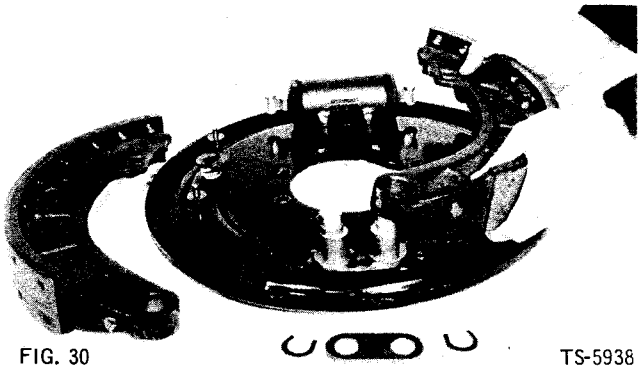


FIG. 30 TS-5938

6. Remove two bolts securing brake wheel cylinder to disc (Fig. 31).

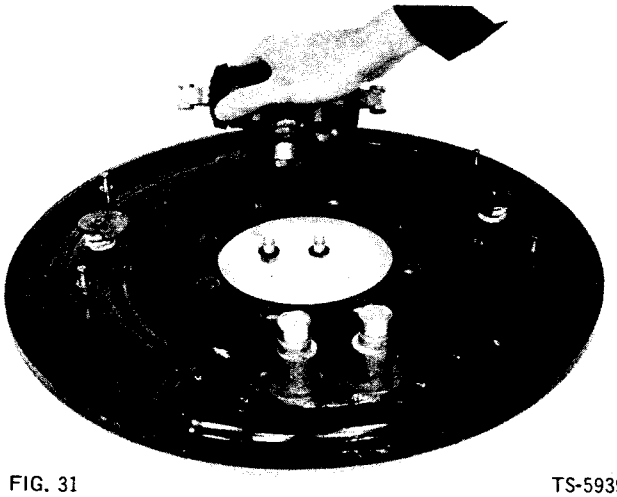


FIG. 31 TS-5939

7. Remove push rods and boots from ends of cylinder. Push piston, cups, and spring from cylinder (Fig. 32).

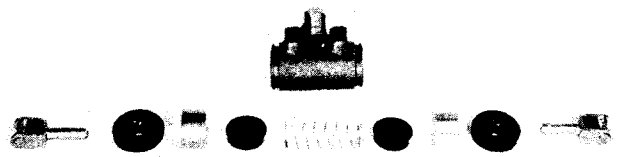


FIG. 32 TS-5371

8. If anchor pin removal is necessary, hold pin and remove nut and lockwasher securing pin to brake disc (Fig. 33).

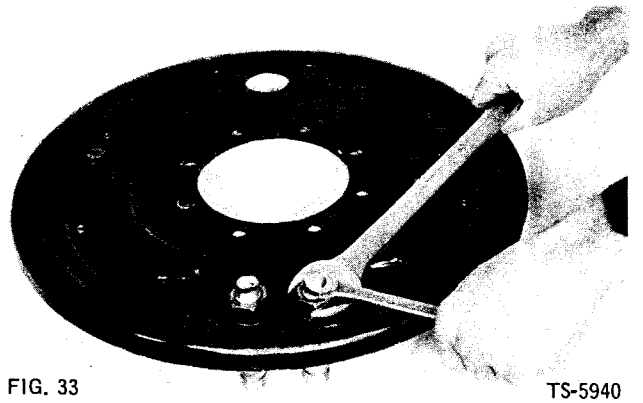


FIG. 33 TS-5940

Disassembly of Parking Brake

NOTE: Axle Part No. 130973 and 131012 are equipped with parking brakes.

1. Remove locating screw nuts and locating screw (Fig. 34).

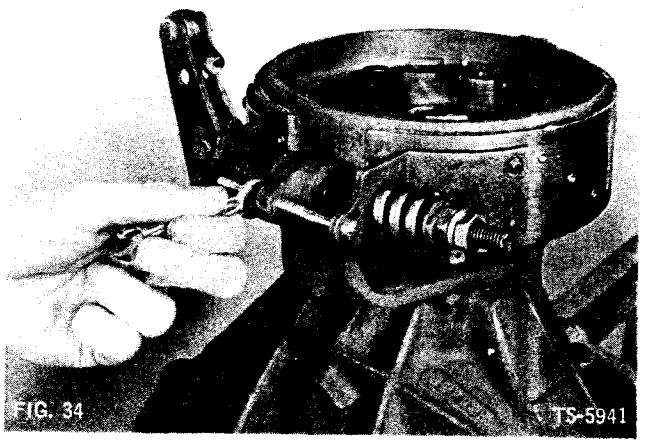


FIG. 34 TS-5941

2. Remove adjusting bolt nuts and lockwasher, and compression spring washer. Pull out adjusting bolt and remove compression spring, brake cam levers, and adjusting end (Fig. 35).

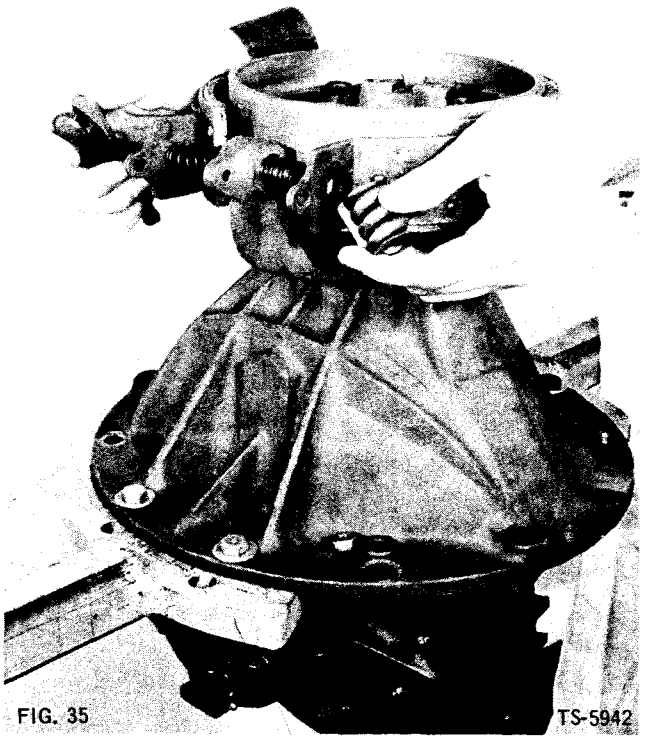


FIG. 35 TS-5942

3. Cut lockwire and remove anchor clip adjusting screw (Fig. 36).

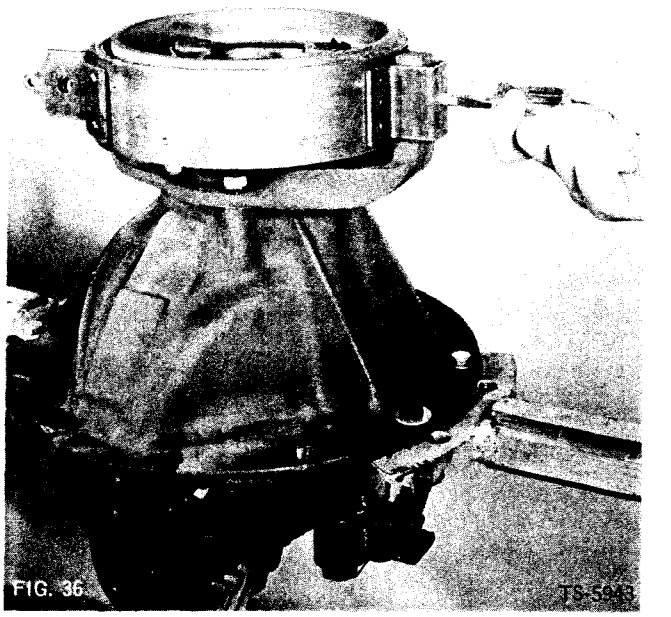


FIG. 36 TS-5943

4. Lift brake band and lining assembly from pinion bearing retaining bracket, taking care not to lose anchor clip spring which is strongly spring loaded between brake band and lining assembly and retaining bracket (Fig. 37). Remove anchor clip spring and brake release springs from retaining bracket.

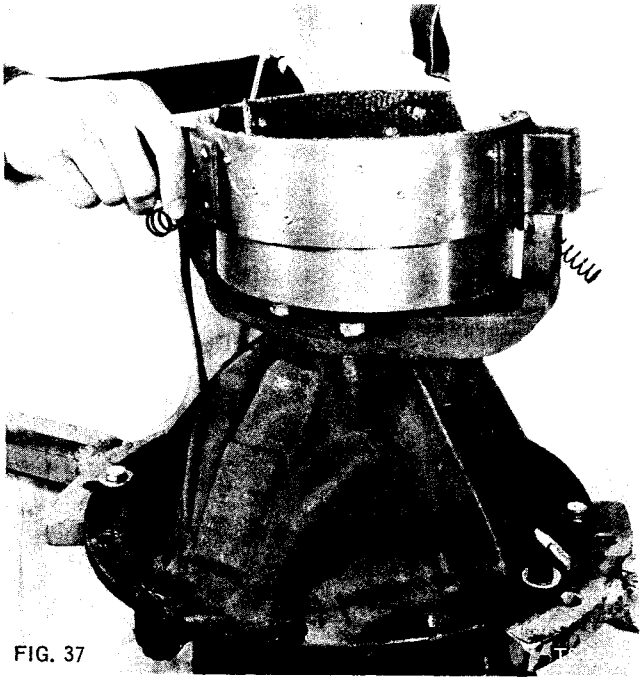


FIG. 37

5. Match mark brake drum and flange with prick punch to indicate relative position for use in reassembly. Remove drum-to-flange bolts, nuts, lockwashers, and brake drum from flange (Fig. 38).

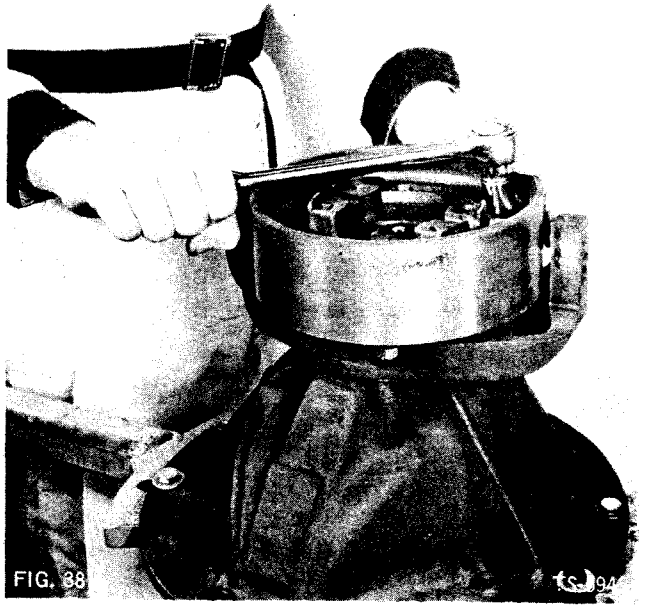
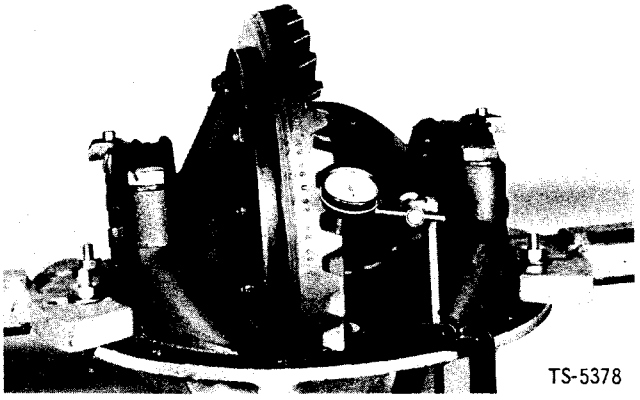


FIG. 38 TS-5394

Disassembly of Differential

1. Mount differential on differential overhaul stand. Check and record ring gear backlash with dial indicator. This information is necessary for reassembly unless a new gear set is installed (Fig. 39).



TS-5378

2. Install flange retainer tool, remove cotter pin, and loosen nut securing flange to differential pinion shaft (Fig. 40). This will facilitate later flange removal.

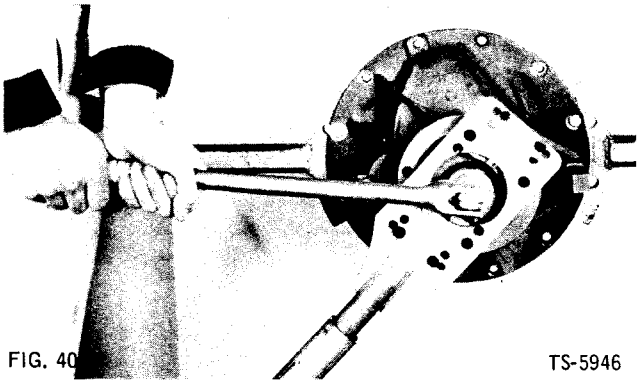


FIG. 40 TS-5946

3. Differential thrust screw is provided on some models. Straighten tang on nut lock and remove thrust screw nut and thrust screw (Fig. 41).

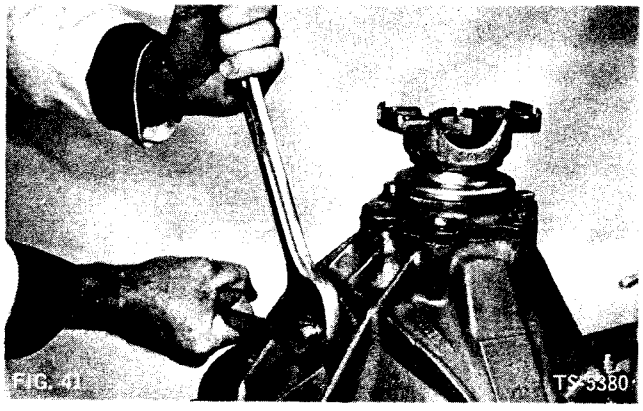


FIG. 41 TS-5380

4. Use center punch to mark bearing caps to differential carrier assembly to assure that parts will be installed in proper location during reassembly (Fig. 42).

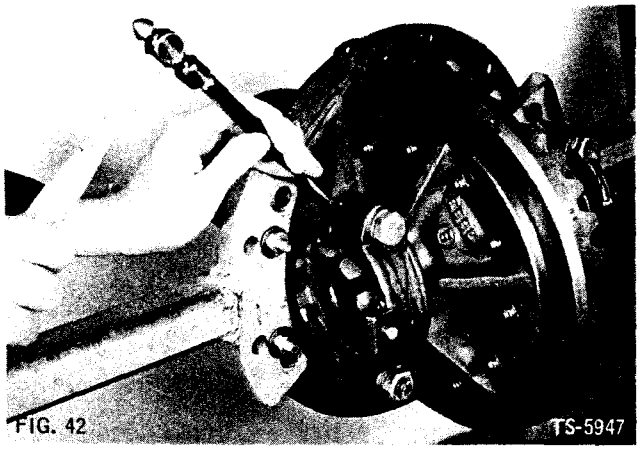


FIG. 42 TS-5947

5. Remove cotter pins and differential adjusting nut lock pins from bearing caps. Cut lockwires and remove bearing cap bolts and bearing caps (Fig. 43).

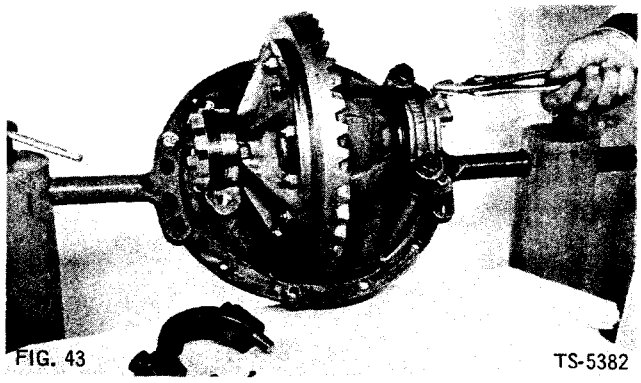


FIG. 43 TS-5382

6. Remove two adjusting nuts and lift ring gear and case assembly from differential (Fig. 44).

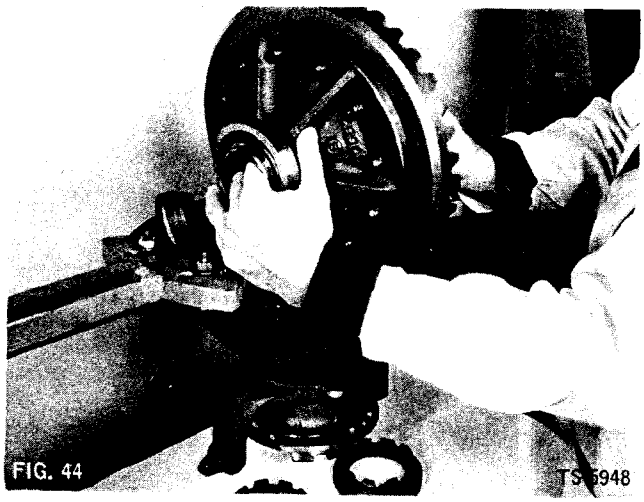


FIG. 44 TS-5948

7. Remove pinion shaft nut and remove companion flange from pinion shaft with suitable puller (Fig. 45).

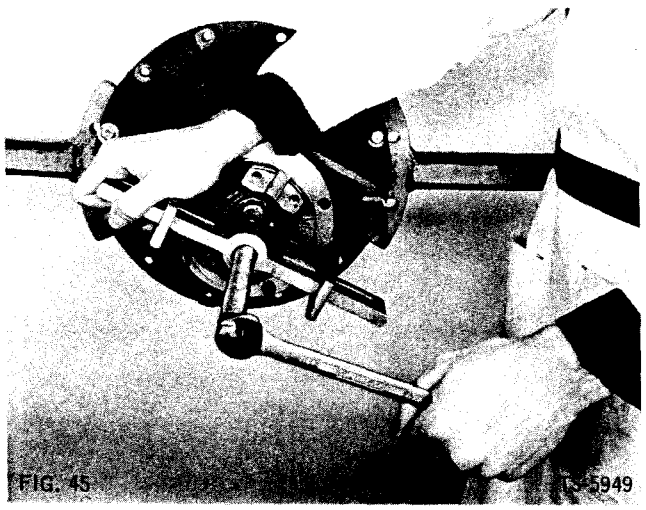


FIG. 45 TS-5949

8. Remove bolts and lockwashers securing pinion bearing retaining bracket to differential carrier assembly; remove bracket with assembled oil seal (Fig. 46).

FIG. 46 TS-5950

9. Use chisel to drive oil seal from pinion bearing retaining bracket (Fig. 47). Take care to prevent scoring oil seal seat.

FIG. 47 TS-5951

10. Press pinion assembly from carrier (Fig. 48).

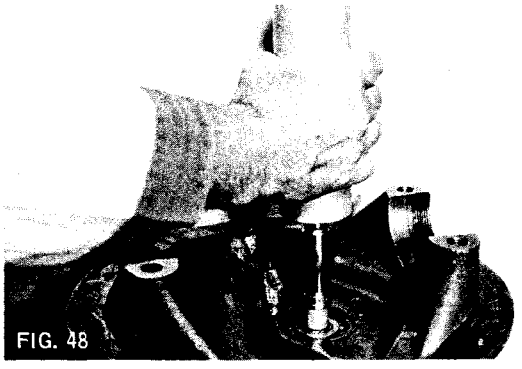


FIG. 48 TS-5385

11. Press bearing cones and cups and bearing spacer from shaft of pinion (Fig. 49).

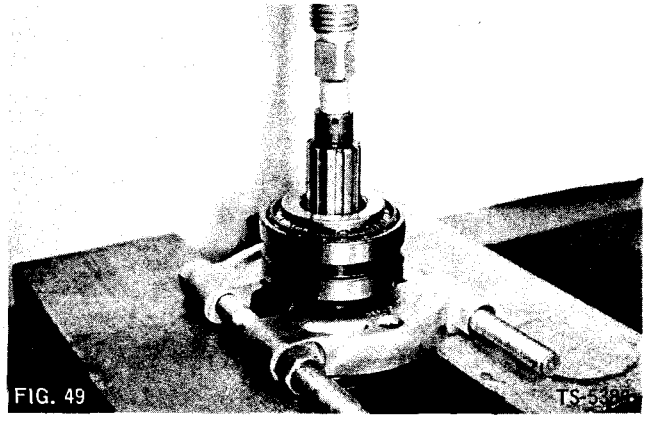


FIG. 49 TS-5386

Disassembly of Differential Ring Gear and Case Assembly

1. Remove bolts and self-locking nuts securing ring gear to case; remove ring gear (Fig. 50).

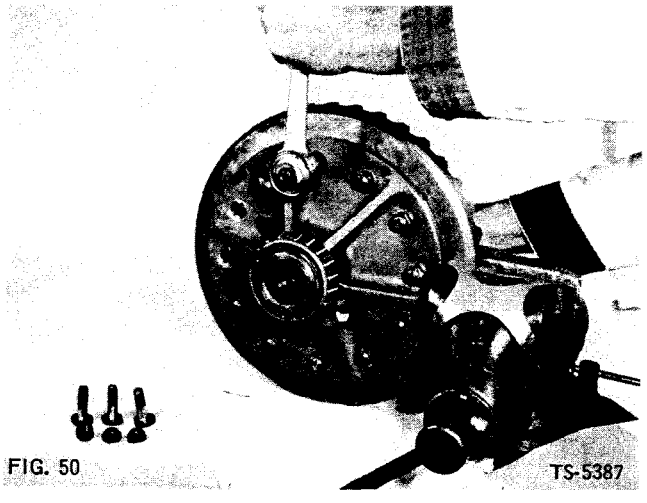


FIG. 50 TS-5387

2. Drive out differential pinion pin lock pin (Fig. 51).

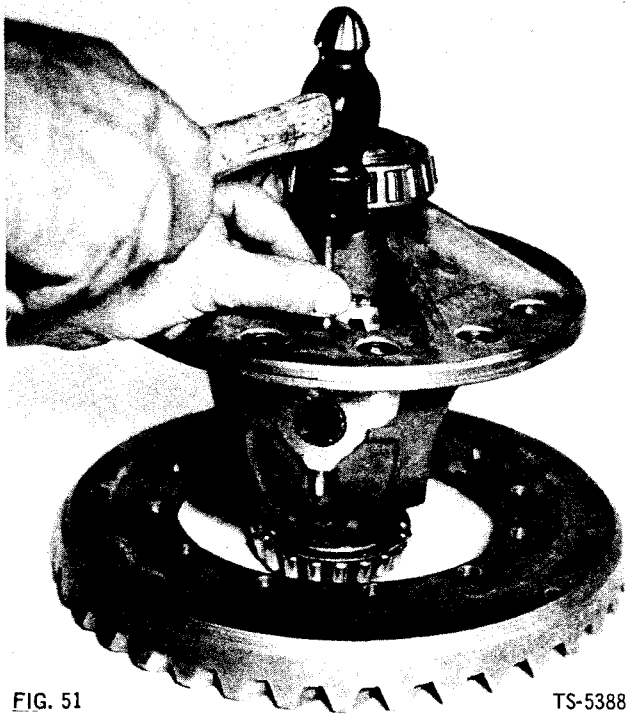
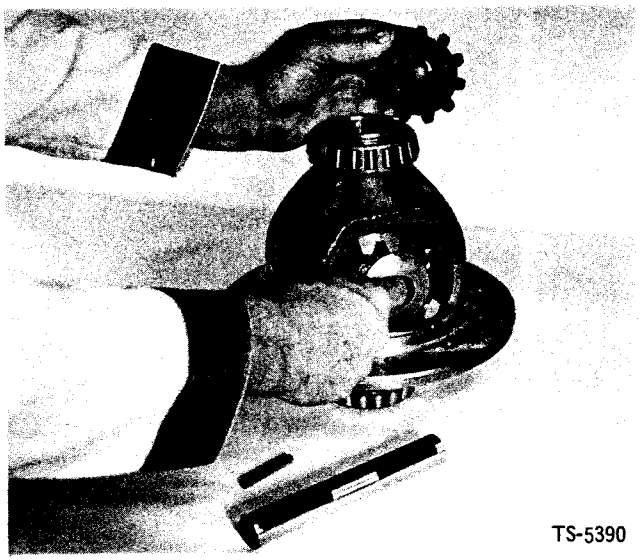


FIG. 51 TS-5388

3. Pull differential pinion pin from case (Fig. 52).

FIG. 52 TS-5389

4. Rotate differential side gears to position differential pinions so that they can be removed. Remove pinions and thrust washers (Fig. 53).



TS-5390

5. Remove side gears and thrust washers (Fig. 54). If tapered roller bearing cones require replacement, use suitable puller to remove from differential case.

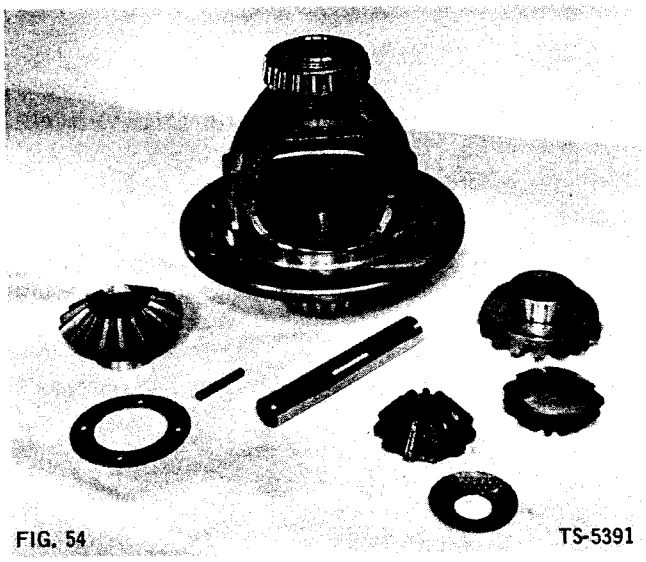


FIG. 54 TS-5391

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 is 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 against 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 housings, 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 solution 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 parts cleaned immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or laping compound.

Brake Shoes and Brake Bands

Do not use solvents or cleaning fluids on brake shoes or parking brake bands. Thoroughly clean brake shoes, bands, and linings with wire brush.

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 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 magna-flux 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 housing, covers and planet spider, 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 service brake linings for wear. If worn to thickness of less than 5/32", linings must be replaced. When replacing linings, replace linings on both ends of axle. Also inspect linings for cracks, loose or missing rivets, oil saturation, or other damage. To replace linings, drill out rivets and remove linings. Install new linings, riveting them in sequence shown (Fig. 55). Set rivets at each numbered location.

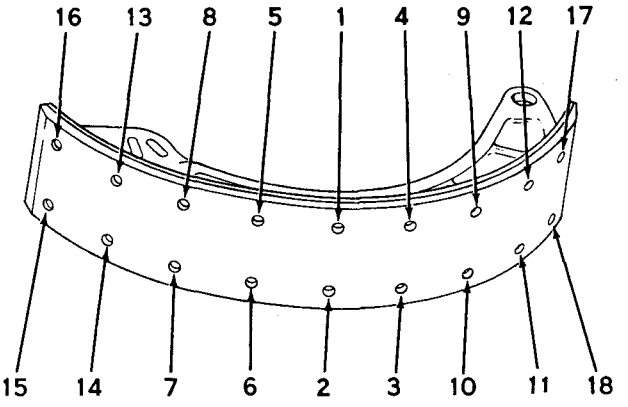


FIG. 55 TS-5952

Inspect parking brake lining. If worn to thickness of less than 3/32", replace the linings. Refer to Fig. 56 for rivet setting sequence.

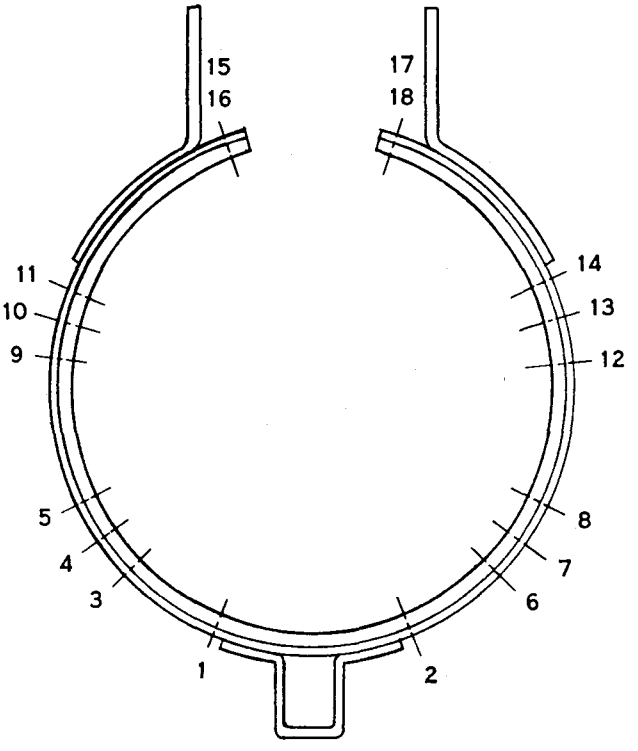
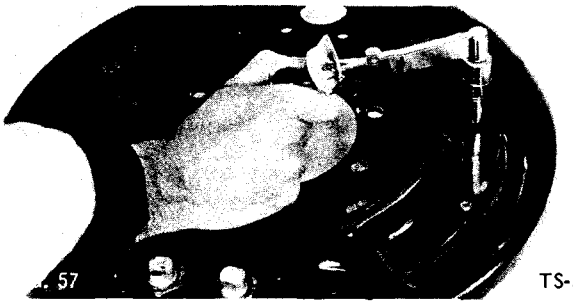


FIG. 56 TS-5953

Check torque required to rotate adjusting cam assembly (Fig. 57). It must be 40 in. lbs. minimum. If torque is not sufficient, grind off peened portion of pin and remove cam, spring and pin. Replace parts; peen end of pin so that it firmly retains cam. Leave cams in fully released position.



TS-5954

Check brake shoe anchor pin bushing for wear. If inside diameter exceeds 1.012", replace bushing.

Check interior of brake drum for scoring, cracks, roughness, or other damage. Turn down scored or rough brake drums on a lathe. Do not remove more metal than necessary to smooth drum braking surfaces. If drum internal diameter exceeds 16.370", replace drum.

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 Ring Gear and Case

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

1. If they were removed, press new tapered roller bearing cones fully onto bearing seats on both ends of differential case. Position side gears and thrust washers in differential case (Fig. 58).

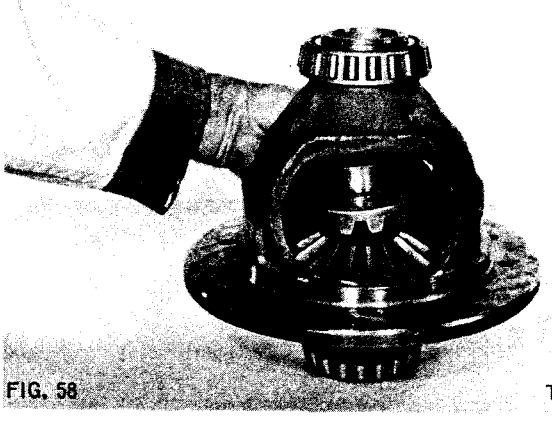


FIG. 58 TS-5394

2. Position differential pinion gears and thrust washers so that gears engage opposite sides of side gears (Fig. 59). Rotate gears so that pinion gears are aligned with mounting holes.

FIG. 59 TS-5395

3. Insert differential pinion pin through bores in case and pinion gears, aligning hole for lock pin in pin with lock pin hole in case (Fig. 60).

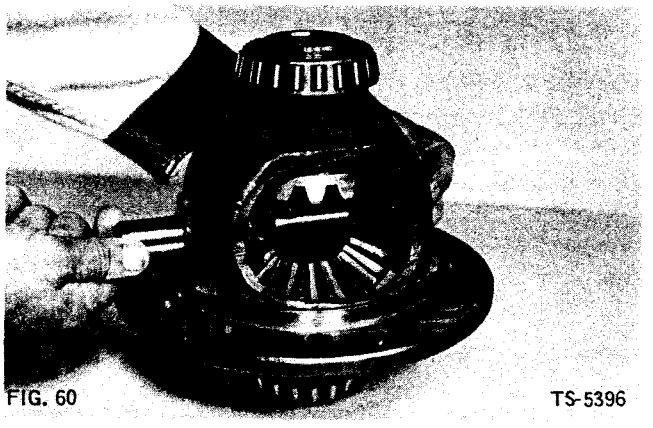


FIG. 60 TS-5396

4. Insert shaft lock pin to retain pinion pin. Stake case with center punch to retain pin in case (Fig. 61).

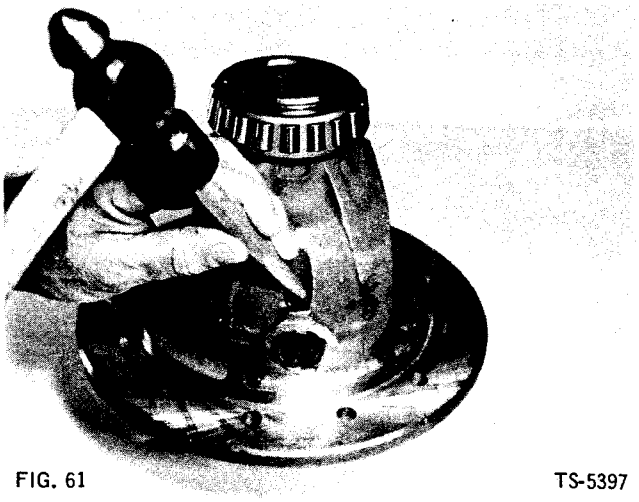


FIG. 61 TS-5397

5. Check ring gear mounting surface of case for burrs. Remove burrs with file (Fig. 62).

FIG. 62

6. Position ring gear on case assembly. Secure with bolts and lock nuts (Fig. 63). Use new nuts to assure proper locking characteristics.

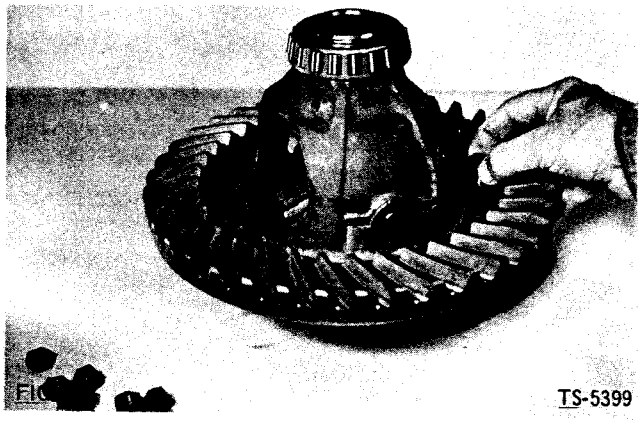


FIG. TS-5399

7. Tighten differential ring gear nuts to specified torque (Fig. 64).

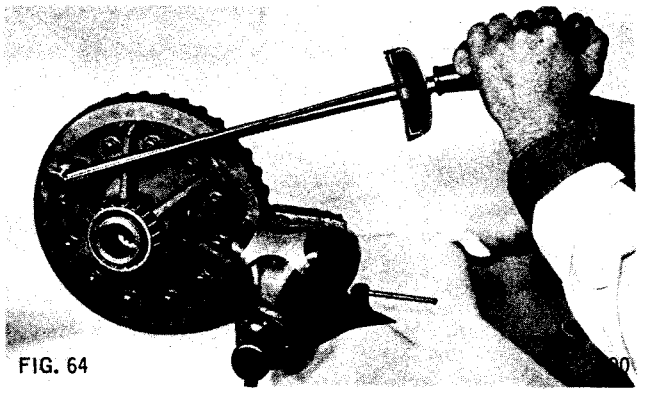


FIG. 64

Reassembly of Differential Pinion Shaft

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

1. Press inner pinion bearings onto end of pinion shaft. Stake inner pinion bearing to pinion shaft in four places (Fig. 65). Use square end staking tool and stake in sequence shown in Fig. 66.

FIG. 65

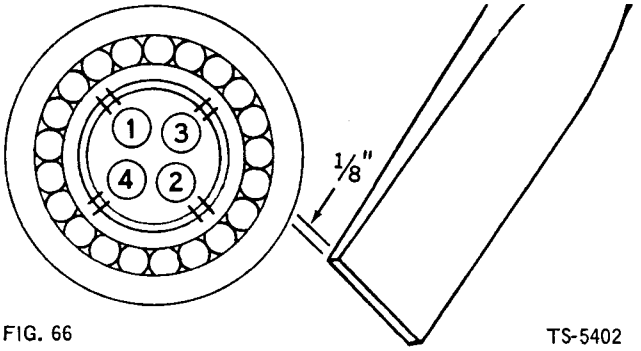


FIG. 66 TS-5402

2. A pinion bearing 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. Press inner pinion bearing cone on shaft of pinion. Position bearing spacer and one .010" shim against bearing cone and install double bearing cup on bearing (Fig. 67). Cup must be positioned with letter "P" stamped on end toward pinion.

3. Press outer bearing cone on pinion (Fig. 68). Lubricate bearings with gear lube and rotate several revolutions to assure normal bearing contact.

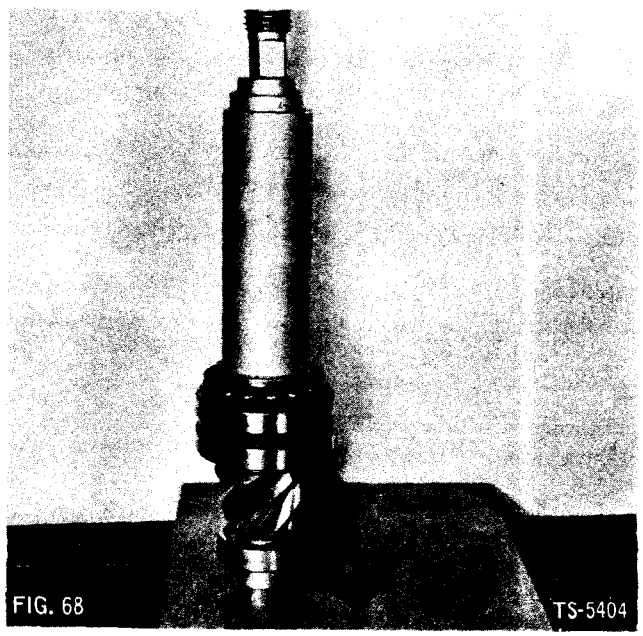


FIG. 68 TS-5404

4. While assembly is in press, apply 500 lbs. pressure to check bearing preload torque. Wrap soft wire or cord around bearing cap and pull in horizontal line with spring scale (Fig. 69). While pulling in straight line (90° from centerline of shaft), read spring scale to measure rotating torque. Multiply reading on spring scale by one-half diameter of bearing cups to obtain preload torque. Correct preload torque is 13 to 23 in. lbs. If bearing preload is not within these limits, remove shims to increase preload or add shims to decrease preload.

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

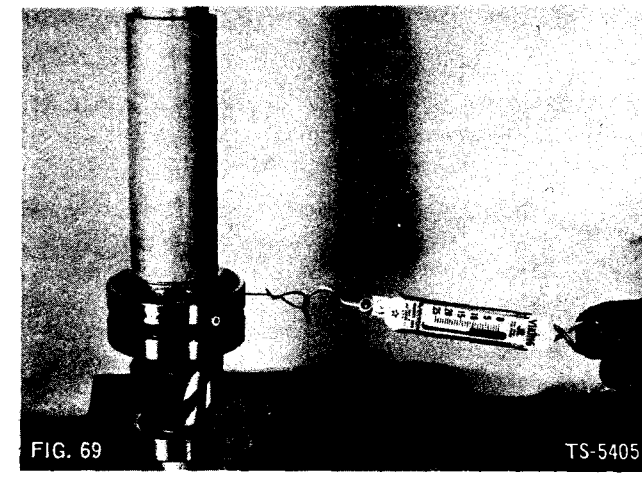


FIG. 69 TS-5405

5. After preload is set, press pinion shaft assembly into differential carrier (Fig. 70). Pressure should be applied only on end of double bearing cup, making sure bearing cup is seated firmly against shoulder in carrier housing.

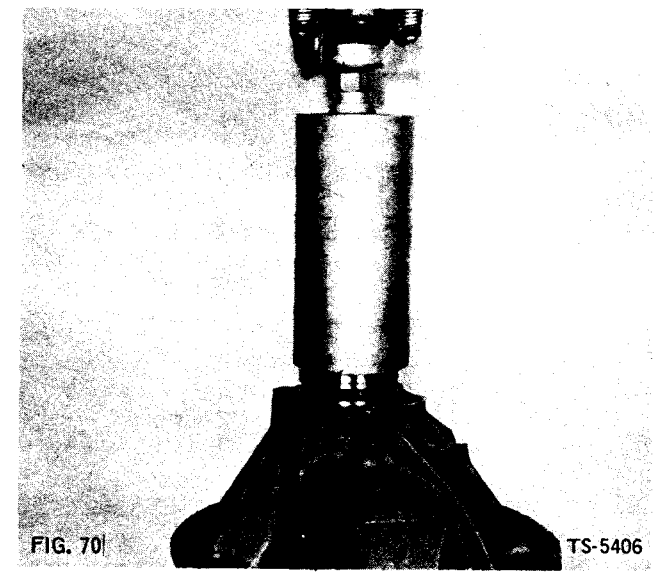


FIG. 70 TS-5406

6. Temporarily install pinion bearing retainer without seal or gasket on differential carrier assembly. Secure with bolts and lockwashers and tighten to specified torque (Fig. 71).

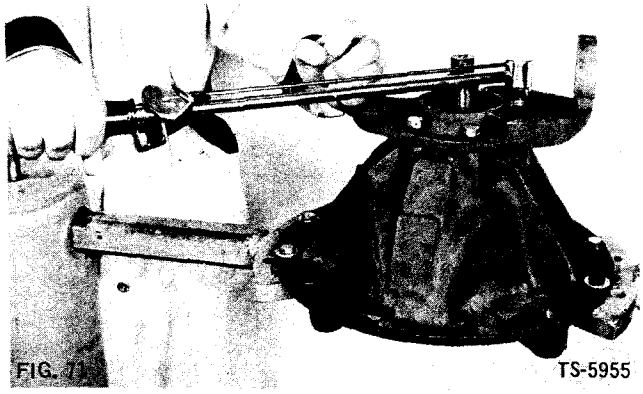


FIG. 71 TS-5955

7. Position companion flange on differential pinion. Install companion flange holding tool and use torque wrench to tighten pinion shaft nut to 300 ft. lbs. (Fig. 72).

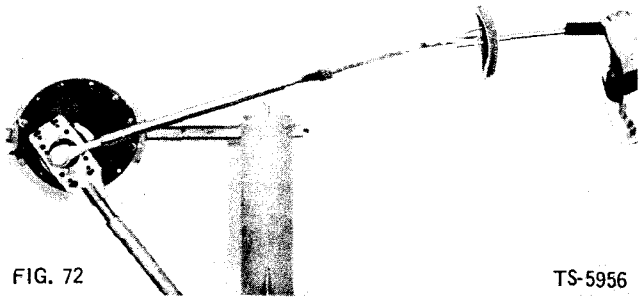


FIG. 72 TS-5956

8. Use "inch pound" torque wrench to check bearing preload (Fig. 73). 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. If preload is satisfactory, remove nut, flange, and bearing retainer.

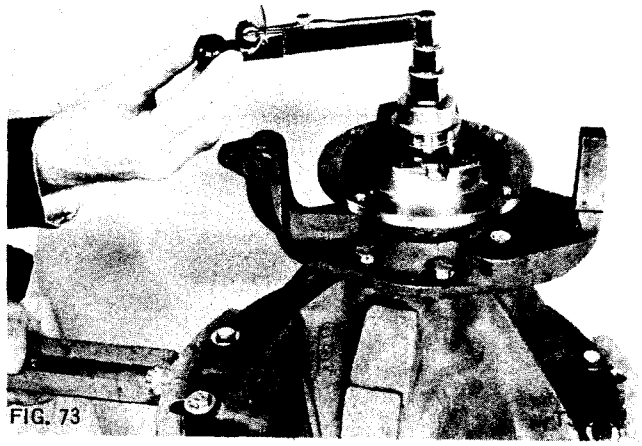


FIG. 73

9. Coat outside diameter of oil seal lightly with Permatex No. 2 or equivalent. Install seal in pinion bearing retaining bracket (Fig. 74). Seal driver dimensions are given in Fig. 75. Wipe off excess Permatex. Lubricate lips of seal with Lubriplate.

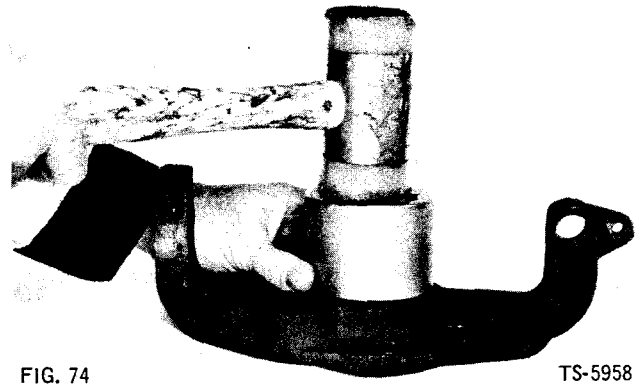


FIG. 74 TS-5958

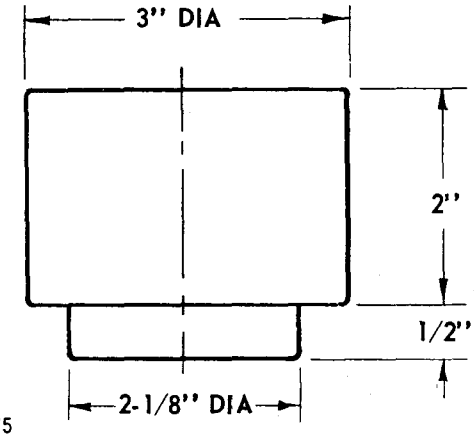


FIG. 75 TS-5959

10. Position the pinion bearing retaining bracket and bearing retainer gasket on the differential carrier so that the cutout in the gasket and the drainback slot in the bracket align with the drainback hole in the carrier (Fig. 76). Secure with bolts and lockwashers and tighten to specified torque.

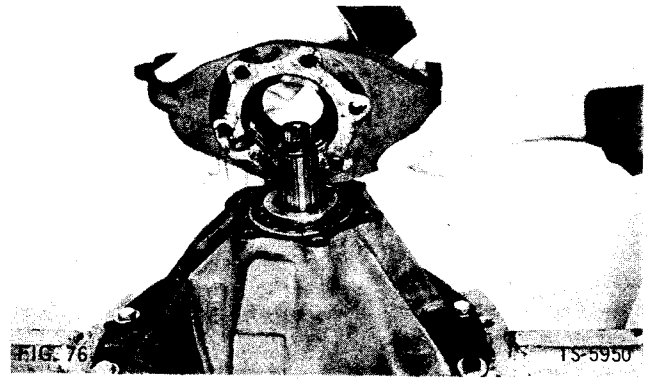
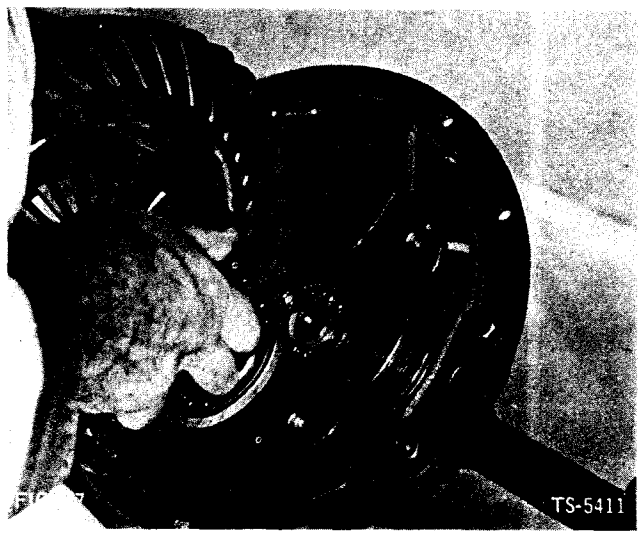


FIG. 76 TS-5950

11. Position flange on pinion shaft; secure with nut torqued to 300 ft. lbs. (Fig. 72). Lock nut with cotter pin.

Reassembly of Differential

1. Make sure bearing cones are properly seated on differential case. Position bearing cups on cones and set ring gear and case assembly in differential carrier (Fig. 77). If bearing cones have been replaced, new bearing cups must also be used.



2. Position bearing cap adjusting nuts in differential carrier, taking extreme care that nuts are not cross-threaded (Fig. 78).

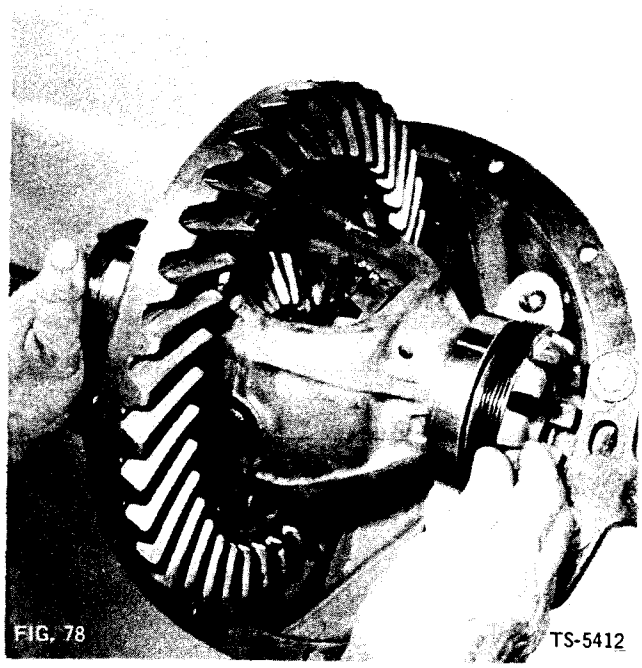


FIG. 78

3. Position bearing caps on bearings and nuts, making sure match marks made during disassembly are properly aligned. Install bearing cap bolts (Fig. 79) and tighten until snug but do not torque.

4. Tighten bearing adjusting nuts to adjust bearings to zero end play. This condition may be checked with screwdriver as shown (Fig. 80). 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.

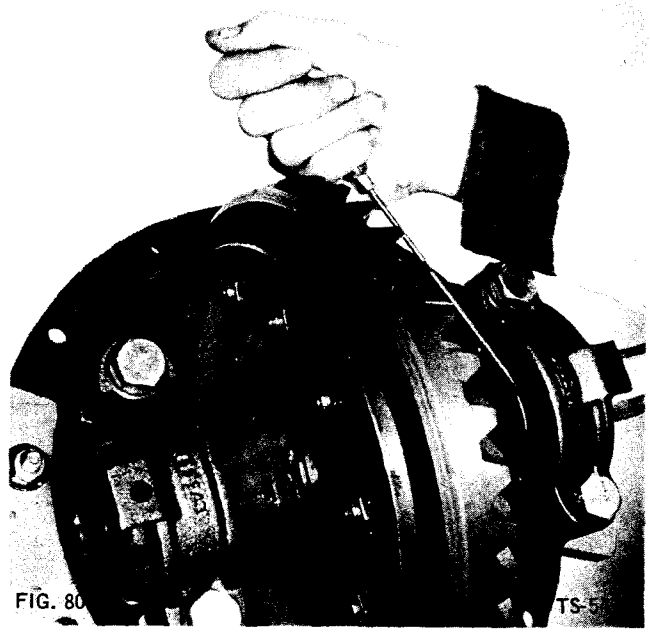


FIG. 80

5. 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 (Fig. 81). 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 .008" to .013", if new gear set is used, or adjust to backlash noted at disassembly for old gears.

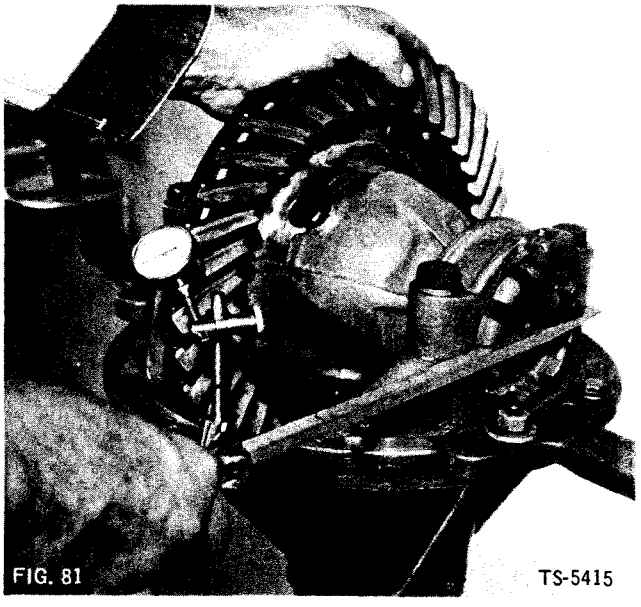


FIG. 81 TS-5415

6. Tighten bearing cap bolts to specified torque (Fig. 82). With dial indicator, recheck ring gear and pinion backlash. Recheck differential bearings for end play as described in step 4.

FIG. 82 TS-5416

7. Use dial indicator to check back face of ring gear. Rotate at least one full turn (Fig. 83). Runout must not exceed .007" total indicator reading. If runout is excessive, remove assembly and check for burrs or dirt under mounting surface of ring gear. Reassemble and recheck.

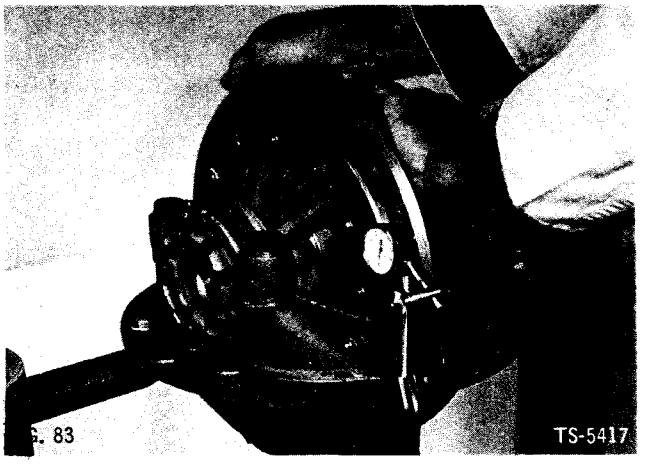


FIG. 83 TS-5417

8. Install adjusting nut lock pins and secure with cotter pins (Fig. 84).

TS-5418

9. Lockwire cap bolts to prevent them from loosening (Fig. 85).

FIG. 85 TS-5419

10. 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 ¼ turn (.010" clearance) Fig. 86). Tighten lock nut and secure by bending tang of lockwasher against flat of nut to secure adjustment.

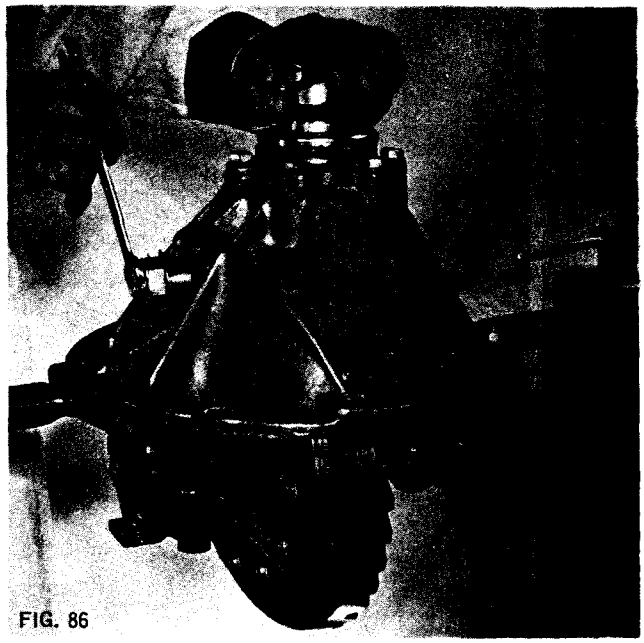


FIG. 86

11. Paint ring gear teeth with mixture of red lead and linseed oil (Fig. 87). Rotate pinion shaft to cause one full revolution of ring gear. Check tooth pattern on ring to determine if proper pinion-to-ring gear tooth engagement exists. Refer to gear tooth contact chart. If proper contact pattern is not as shown (Fig. 88), readjust backlash to secure correct tooth pattern.

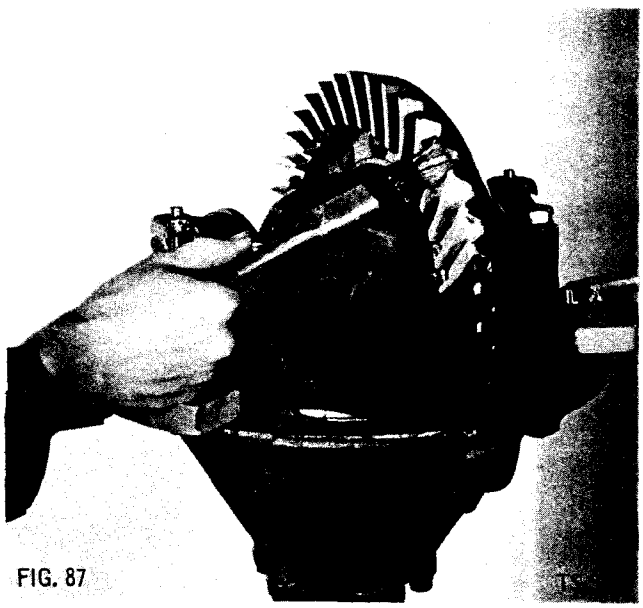
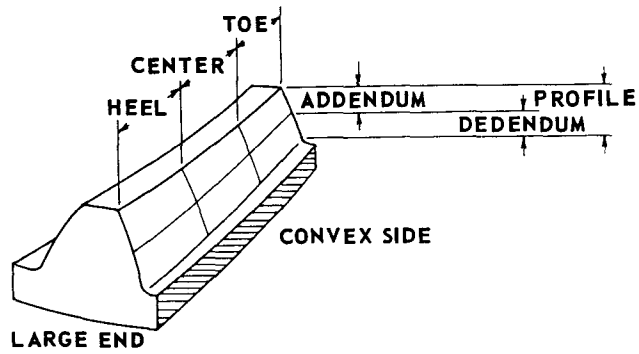
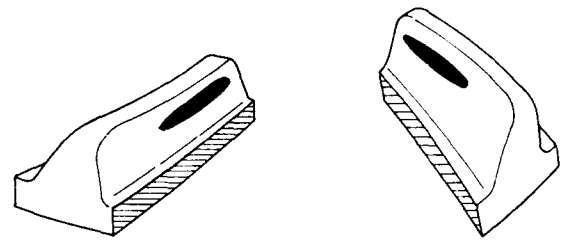


FIG. 87



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



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

FIG. 88 TS-5422

Reassembly of Parking Brake

1. Position parking brake drum on companion flange in relation to match marks made at disassembly. Deep side of drum must face toward differential assembly. Secure with bolts, nuts and lockwashers, and tighten to specified torque (Fig. 89).

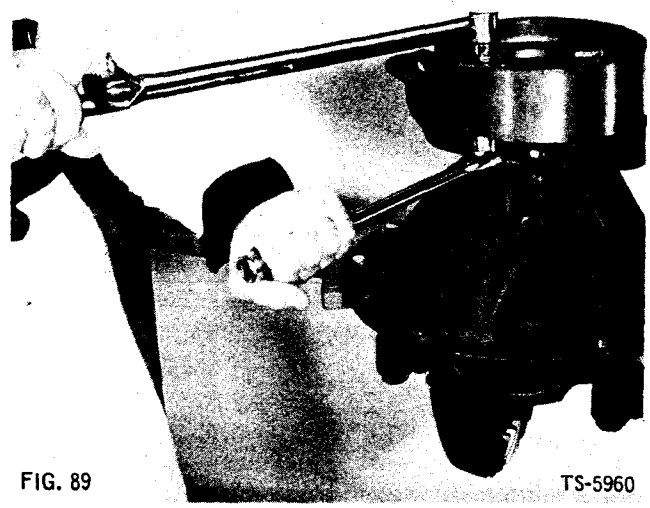
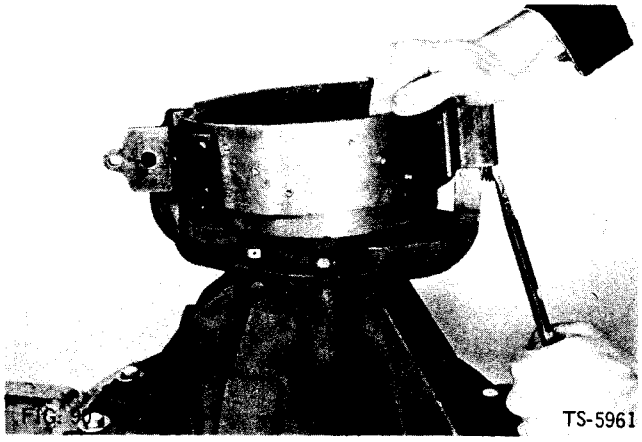
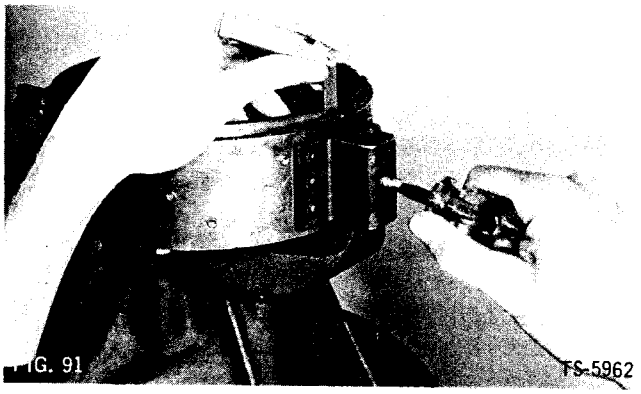


FIG. 89 TS-5960

2. Install anchor clip spring in recess in pinion bearing retaining bracket. Position parking brake band and lining assembly on bracket. Compress spring with screwdriver and fully seat band and lining on bracket (Fig. 90).



3. Align spring with hole in band and lining assembly. Insert anchor clip adjusting screw through spring. Install .030" feeler gage between lining and drum and tighten adjusting screw until light drag is felt on feeler gage (Fig. 91).



4. Install cam levers and adjusting bolt, brake release springs and compression spring as shown in Fig. 92. Install compression spring washer, adjusting bolt nut, lockwashers and second adjusting bolt nut on adjusting bolt, but do not fully tighten at this time.

FIG. 92

5. Install locating screw and nuts as shown in Fig. 93, but do not fully tighten at this time.

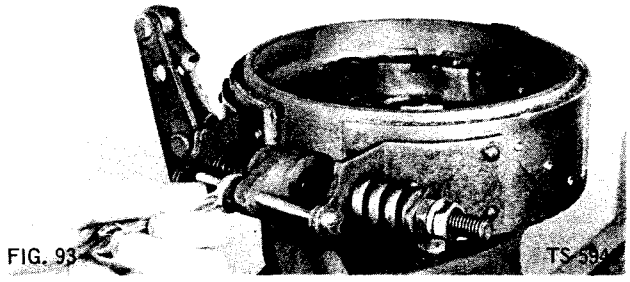


FIG. 93

6. Insert .010" feeler gauge between brake lining and drum at point indicated in Fig. 94, and tighten inner nut on locating screw until a slight drag is felt on feeler gauge when attempting to withdraw gauge. Lock inner nut in position with outer nut, taking care not to move inner nut out of position.

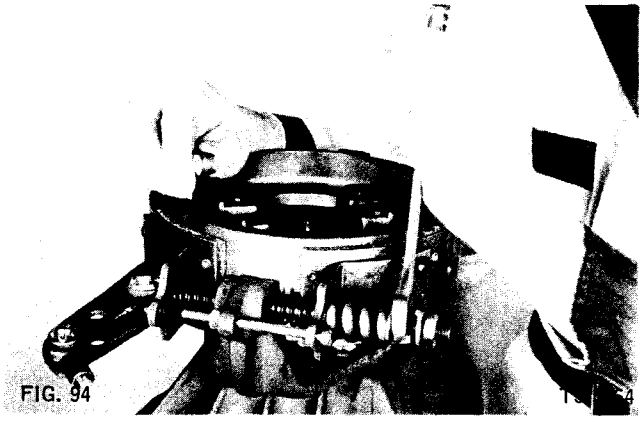


FIG. 94

7. Insert .010" feeler gauge between brake lining and drum at point indicated in Fig. 95 and tighten inner adjusting bolt nut until a slight drag is felt on feeler gauge when attempting to withdraw gauge. Lock inner nut in position with outer nut and lockwasher, taking care not to move inner nut out of position.

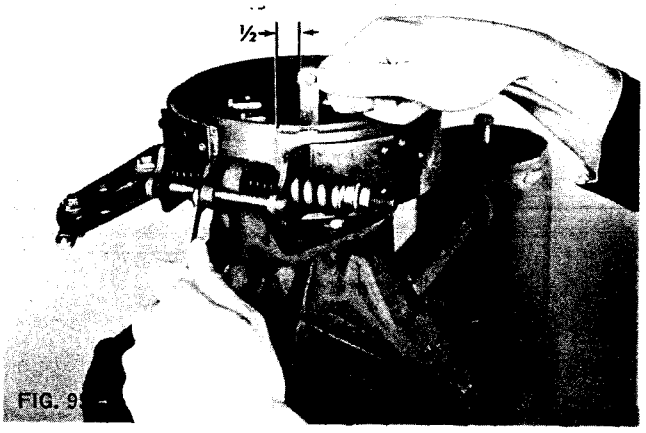


FIG. 95

8. Lockwire anchor clip screw as shown in Fig. 96.

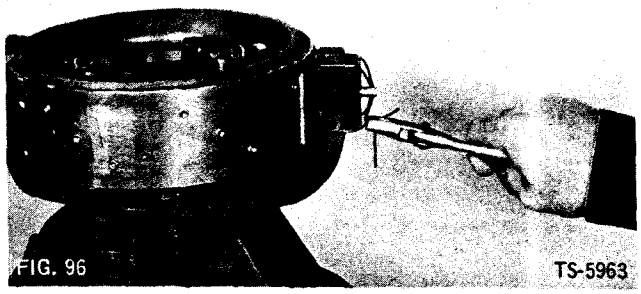


FIG. 96 TS-5963

Reassembly of Brake

1. Coat eccentric of anchor pin with Never-Seez compound and position on brake disc. Secure with nut and lockwasher, but do not tighten (Fig. 97).

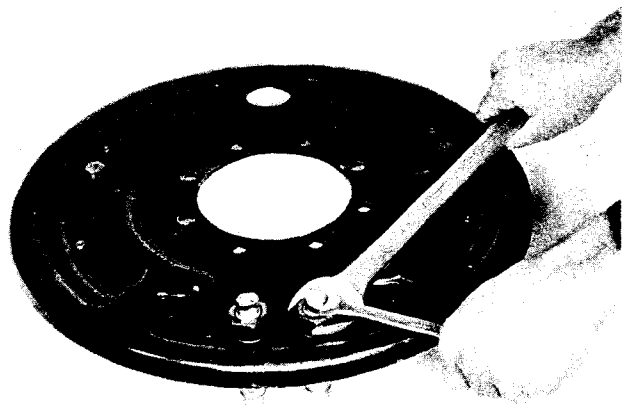


FIG. 97 TS-5940

2. Lubricate operating parts of wheel brake cylinder with hydraulic brake fluid. Insert spring, two cups, and two pistons in cylinder. Assemble boot and push rod and install assembled parts on cylinder (Fig. 98).

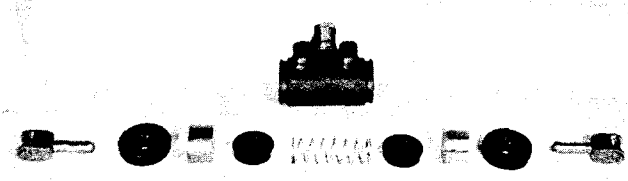


FIG. 98 TS-5371

3. Position brake cylinder on brake disc assembly; secure with two bolts and lockwashers (Fig. 99). Torque bolts to 15 to 18 ft. lbs.

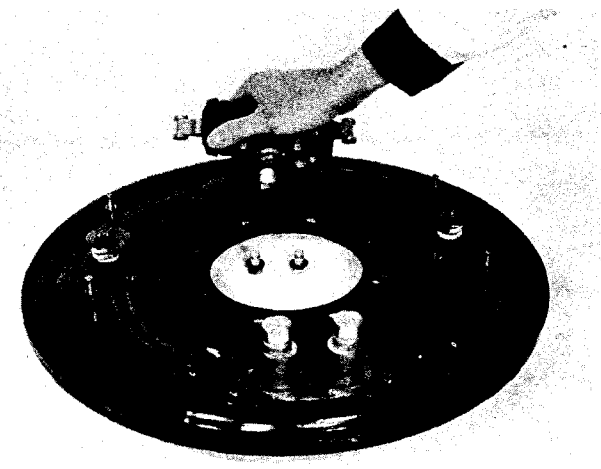


FIG. 99 TS-5939

4. Install washers on guide pins and position brake shoes on disc (Fig. 100).

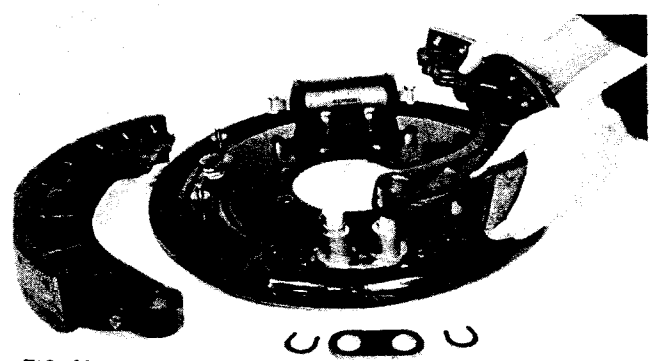


FIG. 100 TS-5938

5. Install washers and "C" rings on guide pins. Clinch "C" rings with pliers. Install strut on anchor pins and secure strut and brake shoes to anchor pins with large "C" rings. Clinch "C" rings with pliers (Fig. 101).

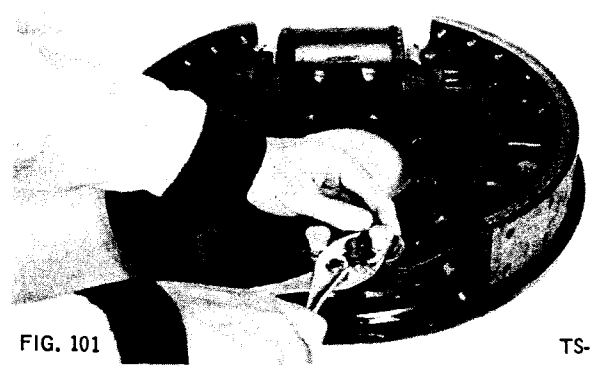


FIG. 101 TS-5965

6. Install brake spring with brake spring pliers. Make sure wheel cylinder push rods are seated in slot of brake shoe (Fig. 102).

FIG. 102 TS-5935

7. Rotate brake anchor pins so that punch marks on end of pins are in position shown (Fig. 103). Rotate brake cams to position shown (Fig. 102).

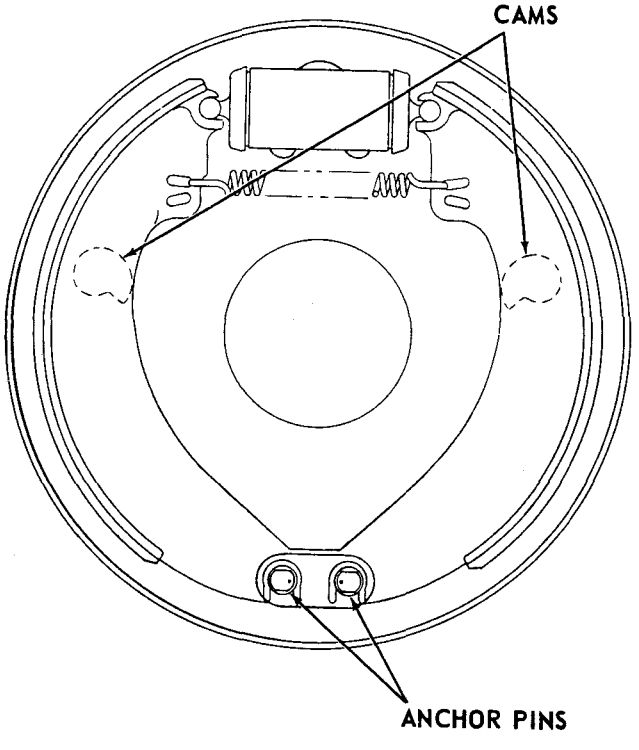


FIG. 103 TS-5966

Reassembly of Hub and Drum

1. If wheel bolts were removed, drive new wheel bolts into bored holes of hub assembly (Fig. 104).

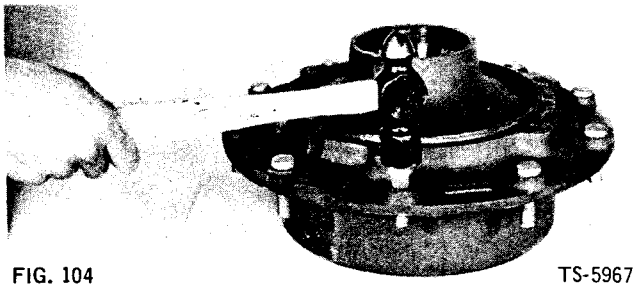
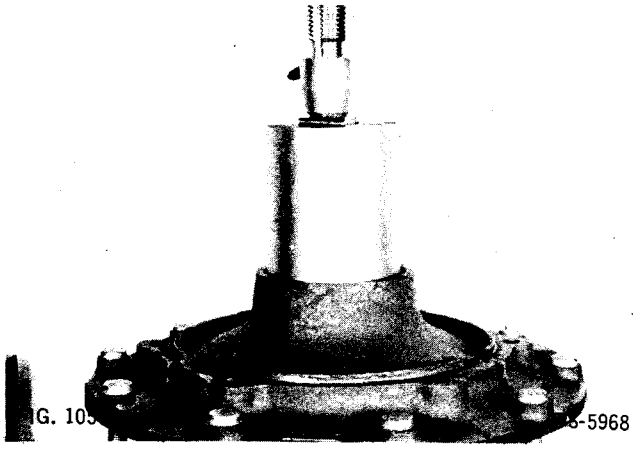


FIG. 104 TS-5967

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 press cups into place (Fig. 105). Bearing driver dimensions are given in Fig. 106 and 107. Make sure cups are fully seated in hub.



G. 105 -5968

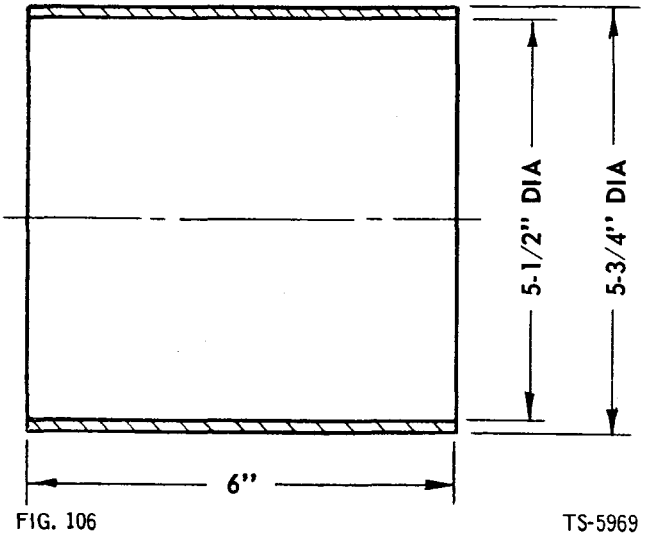


FIG. 106 TS-5969

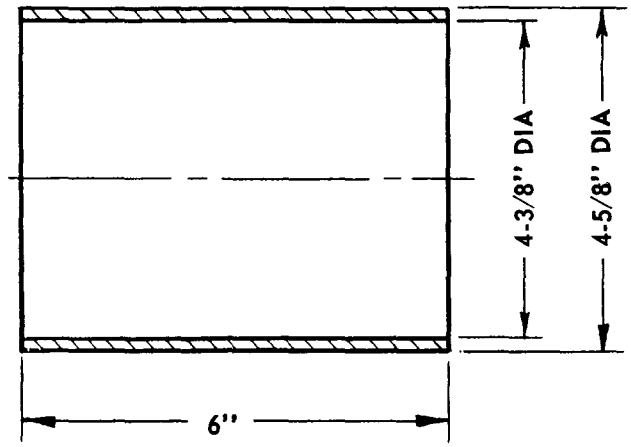


FIG. 107 TS-5970

3. Lubricate inner wheel hub bearing cone with gear oil and position in wheel hub bearing cup (Fig. 108).

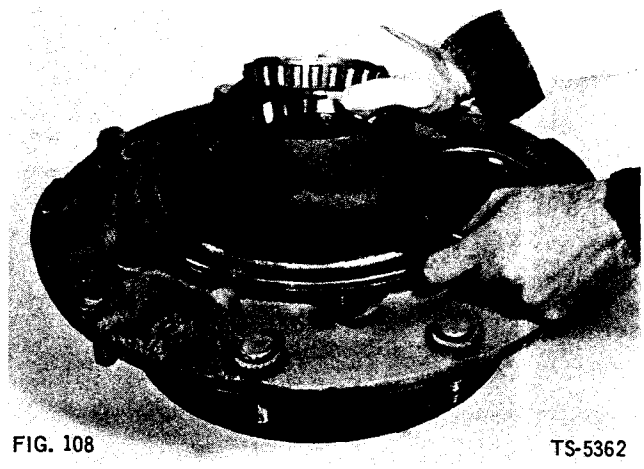


FIG. 108 TS-5362

4. Coat outside diameter of oil seal with Permatex No. 2. Lubricate lip of oil seal with Lubriplate. Press in or drive oil seal into hub using suitable driver (Fig. 109). Figure 110 shows driver dimensions. Spring loaded lip of seal must point inward. Wipe off excess Permatex after seating seal.

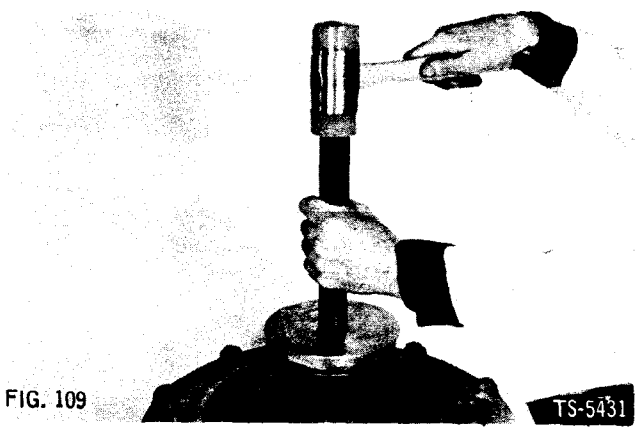


FIG. 109 TS-5431

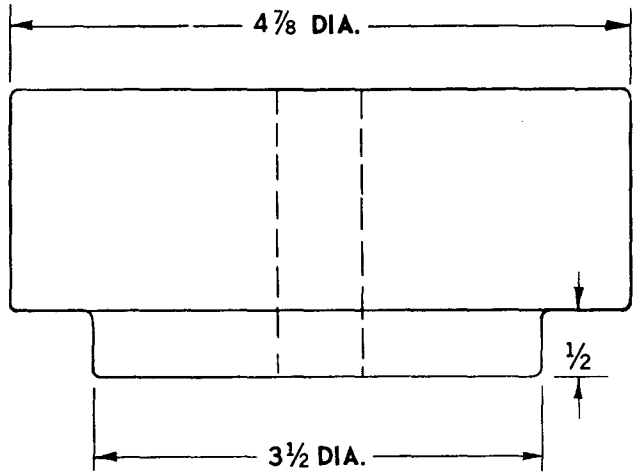


FIG. 110 TS-5432

5. Position oil slinger and brake drum on hub. Make sure hub-to-drum match marks made during disassembly are aligned. Install bolts and flat washers. Tighten to specified torque (Fig. 111).

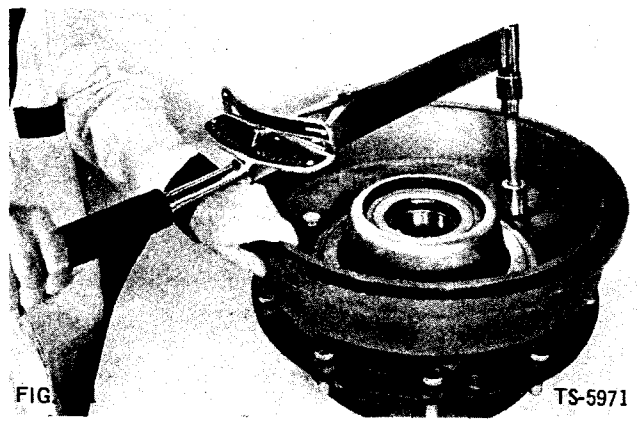
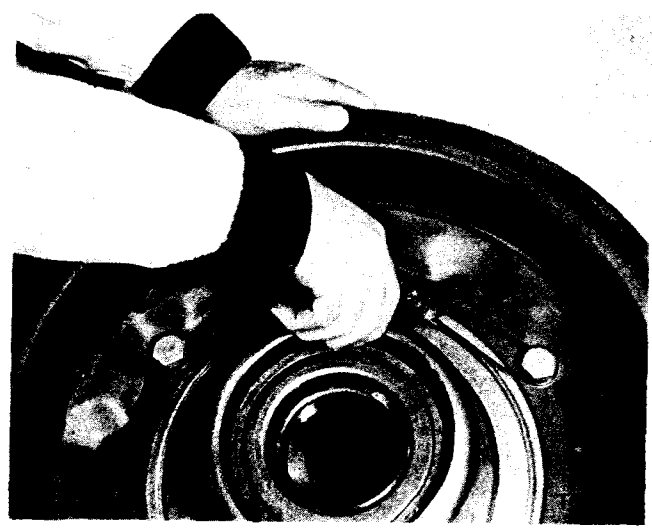


FIG. TS-5971

6. Lockwire bolts in pairs (Fig. 112).



Reassembly of Planet Spider

1. Coat inside of planet pinion with chassis grease to retain pinion needle rollers. Position 34 rollers in inside diameter of pinion so that they are retained by grease (Fig. 113).

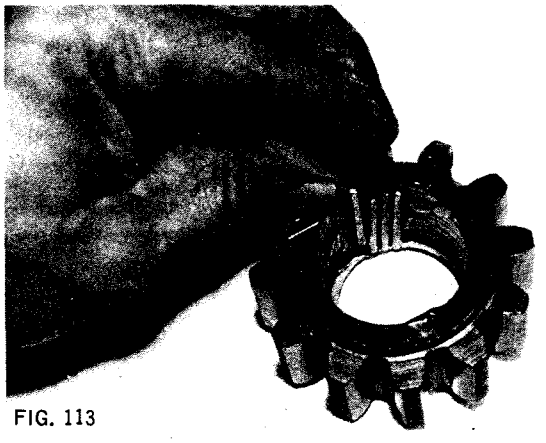


FIG. 113 TS-5435

2. Position pinion and lower thrust washer in planet spider so that tang of thrust washer engages groove of spider. Slide top washer into position between pinion and spider (Fig. 114).

FIG. 114 TS-5436

3. Insert pinion shaft so that hole in shaft aligns with those in housing (Fig. 115).

FIG. TS-5437

4. Drive in pinion shaft lock pin to retain shaft (Fig. 116).

FIG. 116 TS-5438

5. Turn planet spider over, apply light coat of Permatex No. 2 to sealing surfaces of expansion plugs, and position planet expansion plug in seat on spider. Tap sharply on center of plug to retain it in seat (Fig. 117). Repeat procedure to install remaining two planet pinions.

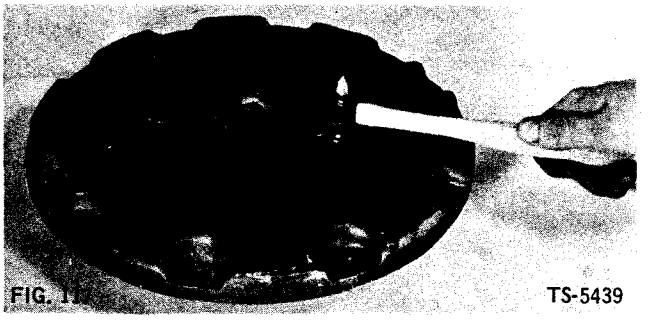


FIG. 117 TS-5439

Reassembly of Axle Parts

1. Check differential mounting flange of axle housing to make sure it is free of dirt and burrs. Apply coat of Permatex No. 2 to mounting flange and position differential on axle housing so that studs in housing engage tapered holes in differential carrier flange (Fig. 118).

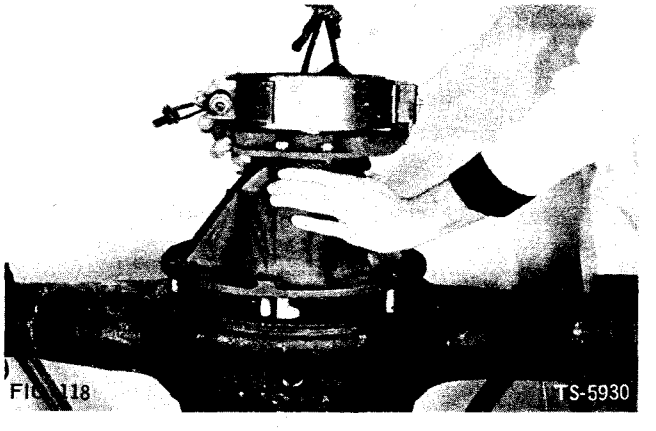
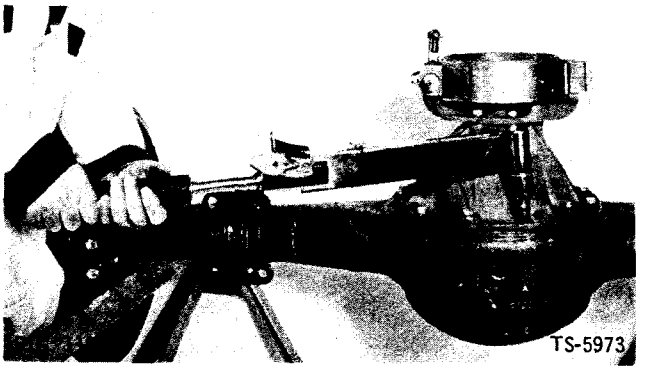
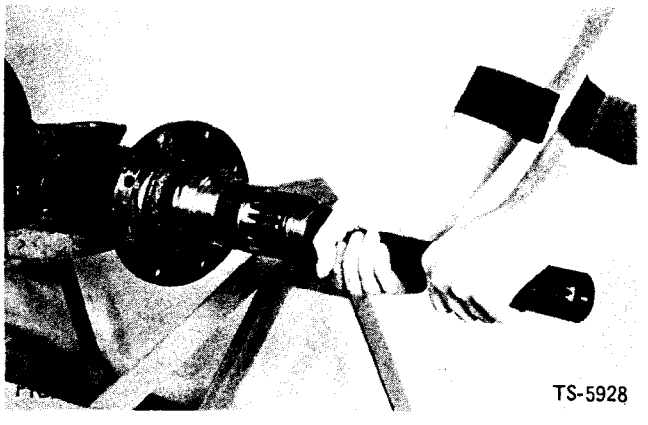


FIG. 118 TS-5930

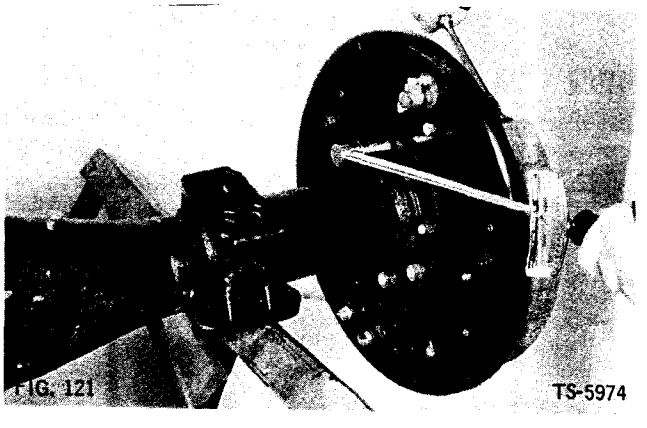
2. Install three tapered dowels on studs and secure with three washers and stud nuts. Secure carrier to housing with mounting bolts and flat washers. Tighten to specified torque (Fig. 119).



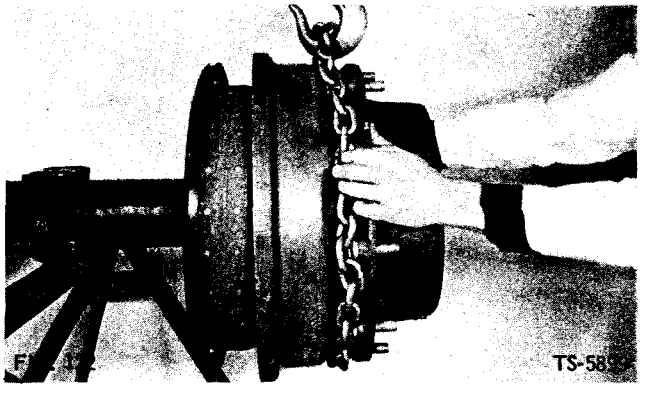
3. Install axle shaft in housing so that splines at inner end of shaft engage splines of differential side gears. End of shaft with retaining ring groove must be toward planetary end of axle (Fig. 120).



4. Position brake assembly on axle housing and secure with bolts, nuts, and lockwashers. Tighten to specified torque (Fig. 121).



5. Lubricate lip of hub and drum oil seal with Lubriplate. Position hub and drum assembly on axle (Fig. 122). Care should be exercised to align hub and drum assembly with spindle so that no cocking of inner hub bearing occurs when sliding on spindle. If difficulty is encountered when trying to slide drum over brake shoes, it is probably caused by improper adjustment of brake shoe cams. During installation, cams must be adjusted so that brake spring tension is at a minimum.



6. Press tapered roller bearing cone on internal gear and hub (Fig. 123). Bearing driver dimensions are given in Fig. 124.

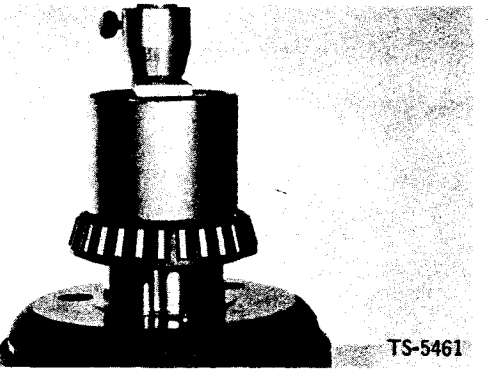


FIG. 123

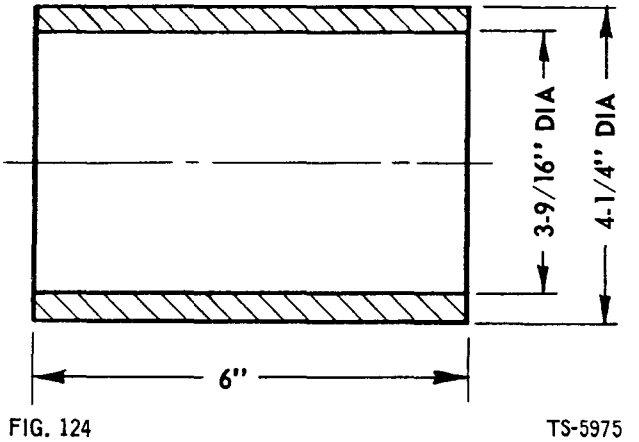


FIG. 124 TS-5975

7. Lubricate bearing cone with gear lube and position internal gear and hub on axle so that it engages splines on spindle (Fig. 125).

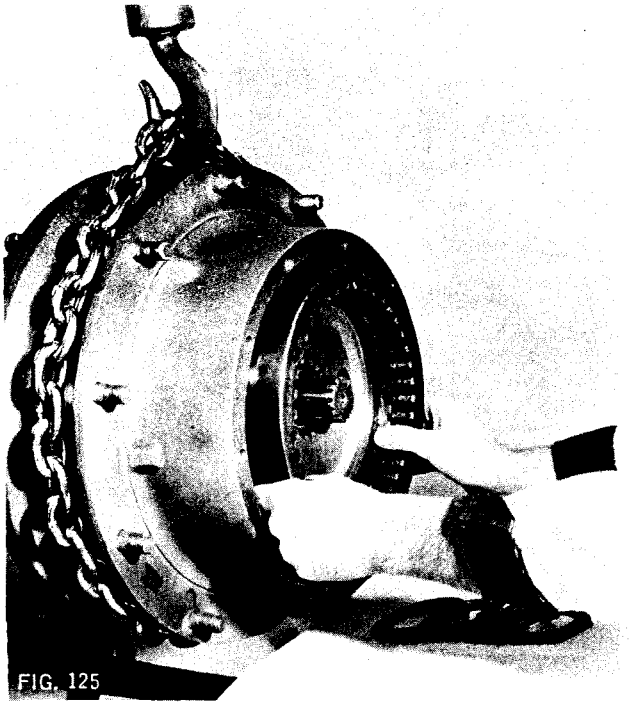


FIG. 125

8. Install flat washer and inner nut on spindle.

   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.

First (Preferred) Method

9. Tighten inner nut while rotating wheel hub in both directions until there is a slight binding (Fig. 126).

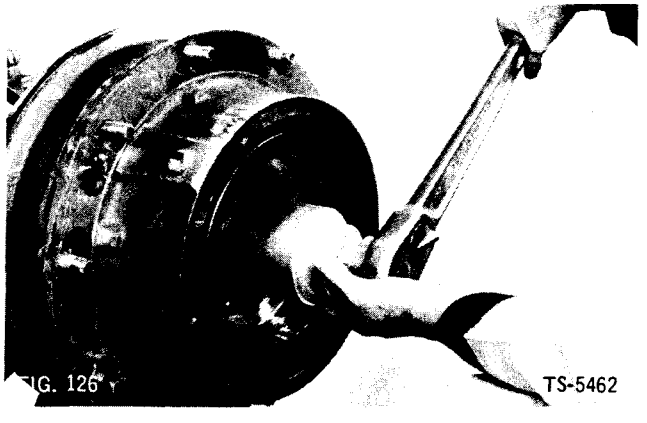
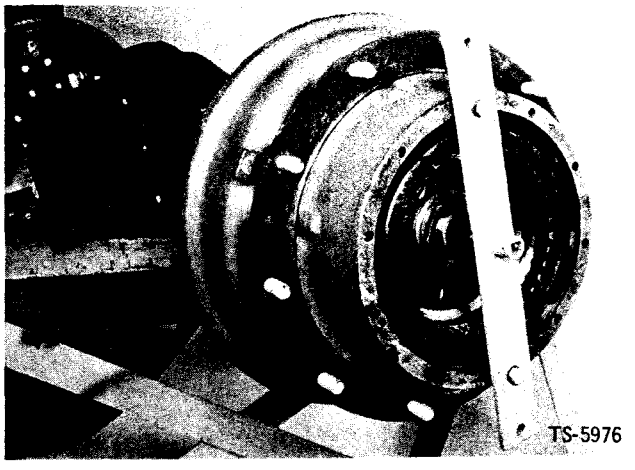


FIG. 126 TS-5462

10. Install torque wrench adapter bar, as shown in Fig. 127, using two 7/16-14 x 1-3/4 bolts. The adapter bar can be fabricated locally to specifications outlined in Fig. 128. Bar illustrated will accommodate wheel hubs with planetary bolt circle diameters of 11-3/8" and 16-1/2".



TS-5976

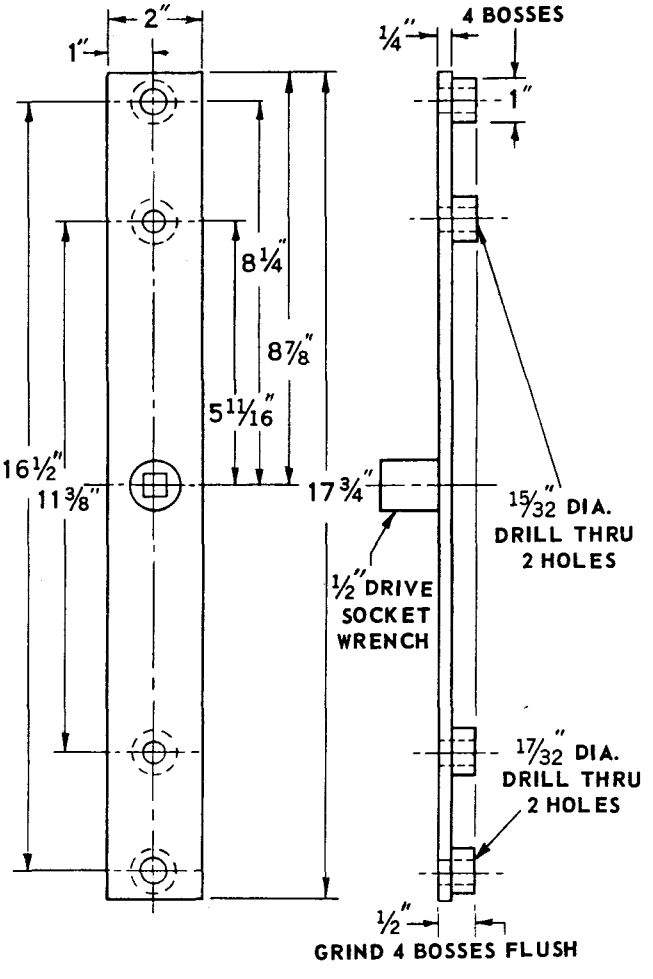


FIG. 128 TS-5471

11. Install torque wrench, 0 to 50 ft. lb. scale if available and check rotating torque or rolling resistance of wheel hub (Fig. 129). Rotating torque when using new bearings should be between 10 and 15 ft. lbs. On used bearings rotating torque should be between 5 and 10 ft. lbs.

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

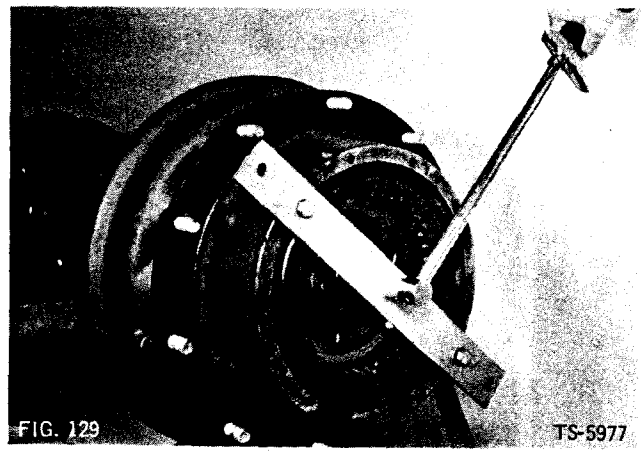
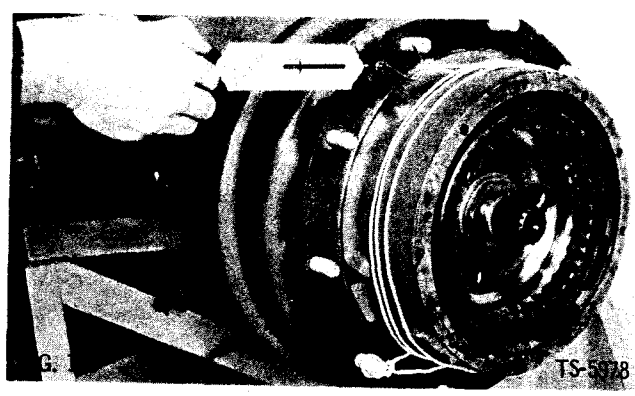


FIG. 129 TS-5977

12. 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 11.

Second (Optional) Method

13. 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. 130. Tighten inner nut until rotating torque measured on pull scale is between 20 to 29 lbs. for new bearings and 10 to 20 lbs. for used bearings.


TS-5978

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 6-1/8" times 25 lbs. (reading on pull scale) equals 153 in. lbs. Dividing by 12 equals 12 ft. lbs. which is within specification of 10 to 15 ft. lbs. rotating torque for new bearings.

14. Install nut lock and outer nut and tighten securely to lock inner nut in position. Recheck rotating preload torque by one of two methods outlined above.

15. Bend two tangs of nut lock against flats on inner nut and bend two tangs against flats of outer nut (Fig. 131).

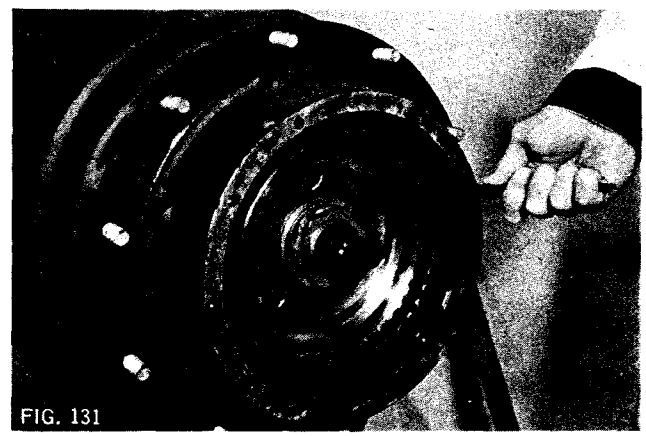


FIG. 131

16. Install sun gear on splined end of axle shaft. Secure gear with retaining ring. Install by seating one end in retaining ring groove and then prying with small screwdriver while sliding it into groove with larger screwdriver (Fig. 132).

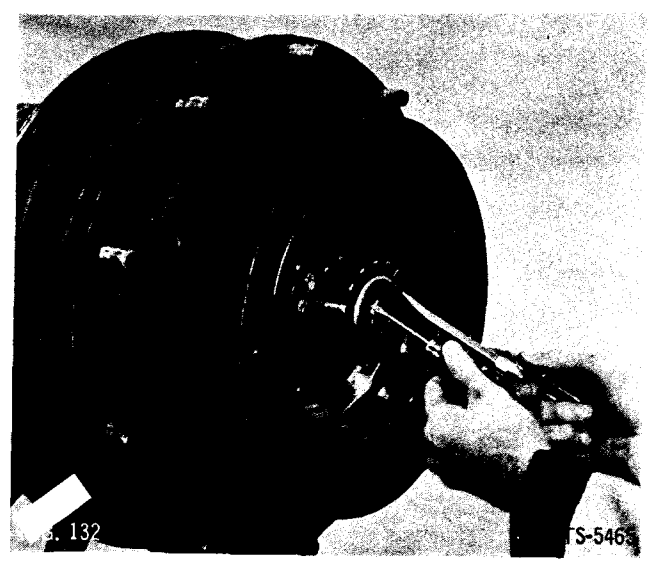
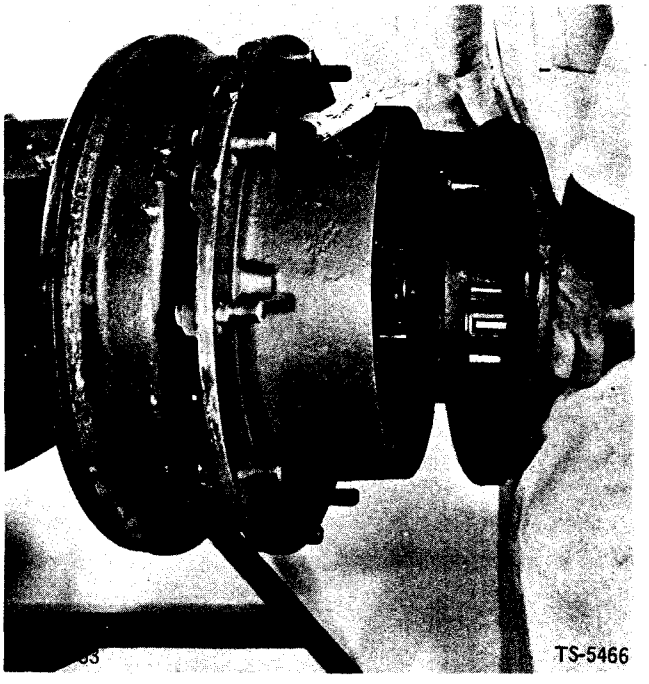


FIG. 132 TS-5463

17. Apply coat of Permatex No. 2 on mounting flange of planet spider. Position planet spider on axle so that planetary gears engage ring gear and sun gear (Fig. 133).



18. Secure planet spider to hub and drum assembly with bolts and lockwashers. Tighten to specified torque (Fig. 134).

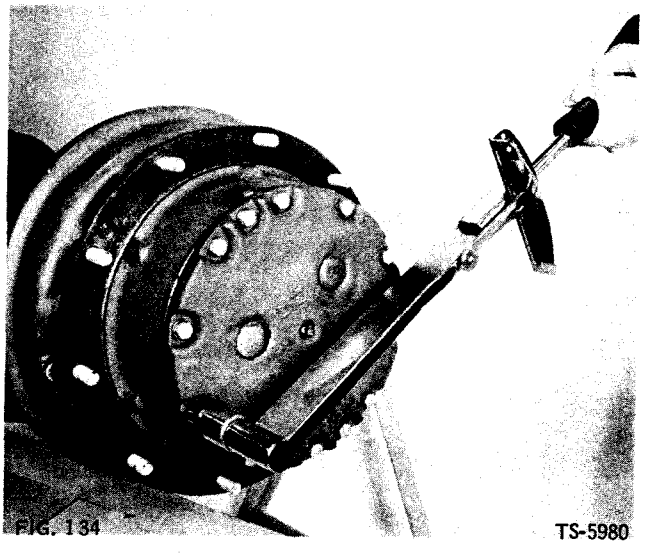


FIG. 134

19. Reinstall all drain plugs.

20. Follow same procedure to reassemble planetary and brakes at opposite end of axle.

BRAKE ADJUSTMENT

After assembly of axle, adjust brakes as follows:

1. Rotate brake cams in direction indicated (Fig. 135) until brake lining drags on drum.
2. Rotate eccentric anchor pin in direction of arrow until brake drag is relieved.
3. Repeat steps 1 and 2 until drag can no longer be relieved.
4. Back off both brake cam and anchor pin just enough to relieve drag.
5. Adjust opposite brake shoes in same manner.
6. Tighten anchor pin nuts 110 to 120 ft. lbs., making sure anchor pin does not rotate while tightening.
7. After installation, make operational check of brakes to assure proper application and release.

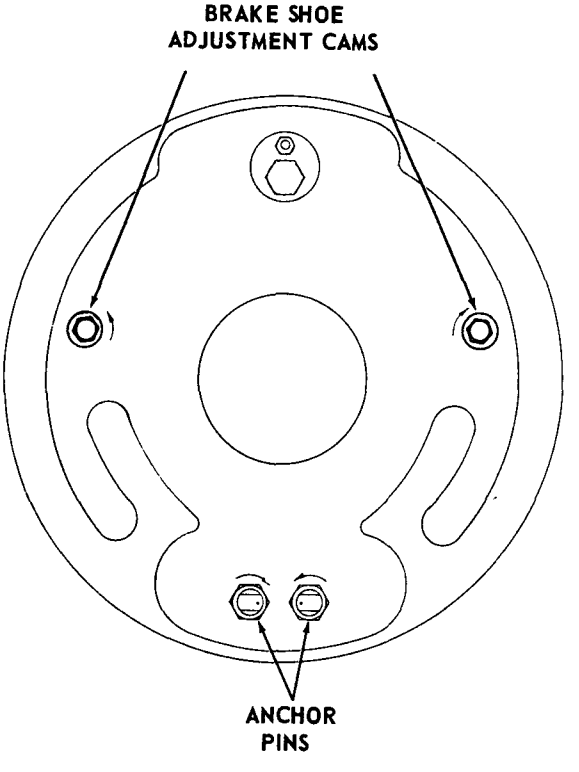


FIG. 135

TS-5981

TABLE OF TORQUE LIMITS

GRADE 5

GRADE 8

COARSE THREADS	DRY	LUBRICATED OR PLATED	DRY	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