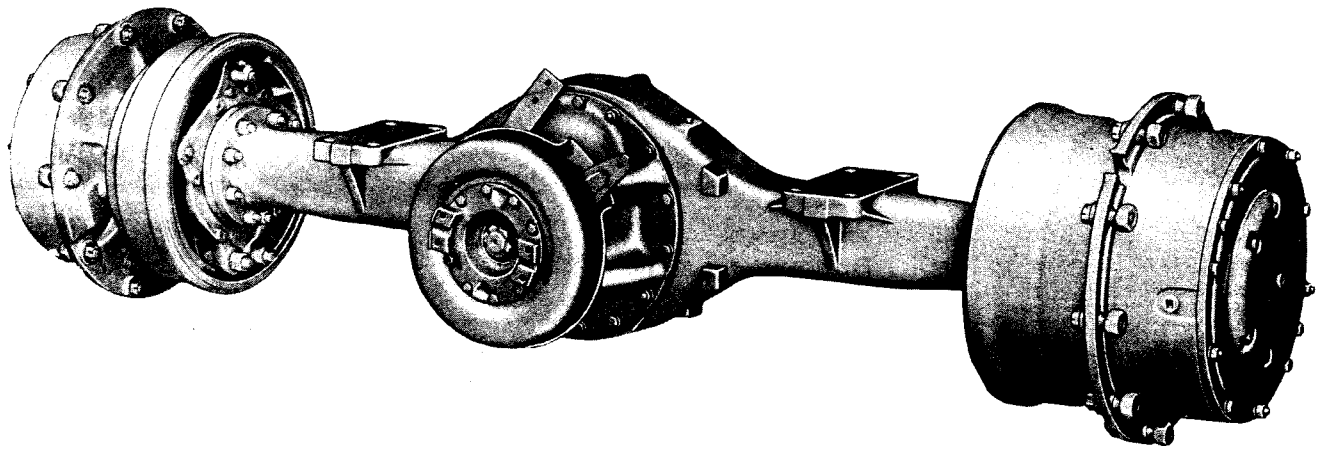
D-17000
D-19000
D-24000
planetary drive axle
maintenance & service manual



CLARK COMPONENTS INTERNATIONAL

A Business Unit of Clark Equipment Company

SMDA-17-19-24 (Rev. 6-87)

FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the Planetary Drive Series Axle Assembly.

Extreme care has been exercised in the design, selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspections at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble-free service.

In order to become familiar with the various parts of the axle, its overhaul and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

To assure the best results and to maintain the original quality built into the axle, it is important that only Clark Components International-approved parts be used when new parts are required. **IMPORTANT: Always furnish the Distributor with the axle and differential serial number when ordering parts.**

CLARK

MS-8 Extreme Pressure Gear Lubricant

MS-8 specifications covers a gear lubricant for use in heavy duty axles. It is a highly refined base stock properly compounded with selected extreme pressure additives. MS-8 meets MIL-L-2105C but is fortified with an additive package that provides added protection during the break-in period and reduced wear and improved efficiency during subsequent operation.

Recommended Lubricants for Clark Drive Axles

Initial Fill

Grade 85W140 qualified MIL-L-2105C gear lubricant as specified in Clark MS-8 engineering standard is preferred for initial fill for most ambient temperatures. (See chart below) For other ambient temperature ranges use proper viscosities of MIL-L-2105C.

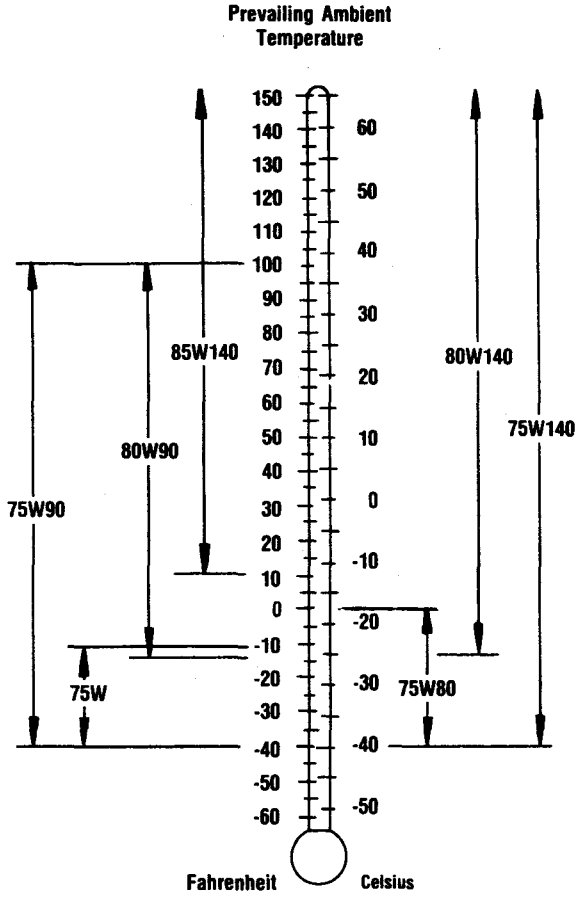
Other lubricants approved to MIL-L-2105C specifications are acceptable for initial fill or top off.

Service Fill

Multipurpose gear lubricants approved to the MIL-L-2105C specifications are recommended.

MIL-L-2105C classifies multigrade gear lubricants on the basis of their viscosities at various temperatures.

Listed below are the recommended multigrade viscosities for use at the prevailing operating temperatures in Clark Drive Axles.



For proper viscosity lube, refer to fahrenheit or celsius chart below.

Gear Lubricant Chart

Ambient Temperature Ranges				Multigrade Viscosities MIL-L-2105C
				See (a) note below.
-40°F	to	-10°F	(-40°C to -23°C)	75W See (b) note below.
-40°F	to	0°F	(-40°C to -18°C)	75W80
-40°F	to	+100°F	(-40°C to -38°C)	75W90
-40°F	+	Above	(-40°C + Above)	75W140
-15°F	to	100°F	(-26°C to 38°C)	80W90
-15°F	+	Above	(-26°C + Above)	80W140
+10°F	+	Above	(-12°C + Above)	85W140

Notes:

(a) The MIL-L-2105C Specification replaced the MIL-L-2105B Specification.

(b) The MIL-L-2105C 75W Classification replaced the MIL-L-10324A Subartic Specification.

Note: Specifications are subject to change.

Checking Oil Level in Drive and Drive Steer Axles

For off-highway operation, check lubricant level after each 250 hours of operation. Always maintain lubricant level to bottom of filler plug hole. Drain oil every 2500 hours, or one year whichever comes first.

For highway operation, lubricant should be checked each 5000 miles [8000 km]. Maintain lubricant level to bottom of filler plug hole. Drain oil every 25,000 miles [40,000 km] or one year whichever comes first.

To check oil level in axles with differential drive and planetary wheel ends, the axle should be run first, then allowed to stand for a minimum of five minutes on level ground. This procedure will allow oil to drain back to its normal level. After the five minute interval, remove oil filler plug in axle center and in the planetary wheel ends for oil level inspection. If oil level is not to the bottom of the filler hole, add necessary lubricant.

Checking and Filling Planetary Wheel Ends

Always check lubricant level in planetary wheel ends with wheel hub oil level plug and/or arrow in a down position. Remove oil level plug. If lubricant is below oil level hole, remove filler plug and fill to oil level hole. Reinstall plugs.

Inter-axle Differential

To fill axles with inter-axle differential, add four (4) pints [1,9 liters] of lubricant in the input shaft differential case filler hole, install filler plug. Fill axle center until oil drips from bottom of filler hole, install housing filler plug. Fill planetary wheel ends as explained above.

Filling Drive and Drive Steer Axles

Axles with single or double reduction at center: Fill axle housing through filler hole until lubricant is at bottom of filler hole.

Axles with planetary wheel ends. Follow procedure in "checking and filling planetary wheel ends."

Liquid Cooled Brakes (LCB)

A. The following oils are allowable to use on the actuator side of the 10,000 & 20,000 series liquid cooled brakes.
1 - Motor Oil API SE/CD.
2 - MIL-L-46152B/MIL-L-2104 C or D.
3 - ATF C-3 or *DEXRON®. Not *DEXRON II® **(See Note Below).**
4 - Hydraulic Oils.
5 - Water/Oil Invert Emulsion.
6 - Synthetic Gear Oils (Chemical Ester)

B. Brake sump cooling oils (when external cooling is used). The following cooling oils are recommended in order of preference.
1 - Organic Esters
2 - Hydraulic Oil
3 - MIL-L-46152B/MIL-L-2104 C or D.
4 - ATF C-3 or *DEXRON®. Not DEXRON II® **(See Note Below).**
5 - Motor Oil API SE/CD.
6 - Invert Emulsion
and all of the oils in A above can be used in the brake sump except water/oil invert emulsion must not be used with the LCB 10,000 series shipped from Clark before 1 June 1984 because of incompatibility with the friction discs.

C. Axle assemblies with Liquid Cooled Brakes having a common brake and gear sump (no brake external cooling used), use
1 - Gear Lubricant meeting Clark specifications MS-8,
2 - MIL-L-2105C.

Draining

Draining is best accomplished immediately after vehicle has operated a short time or completed a trip. The lubricant is then warm and will flow freely, allowing full drainage in minimum time. This is particularly desirable in cold weather.

Remove plug at bottom of axle housing and allow sufficient time for lubricant to drain. With planetary wheel ends, rotate wheel until filler hole is down. Remove plug and allow sufficient time for draining. Be sure planet cover oil level hole is in proper position when refilling wheel ends.

Flushing

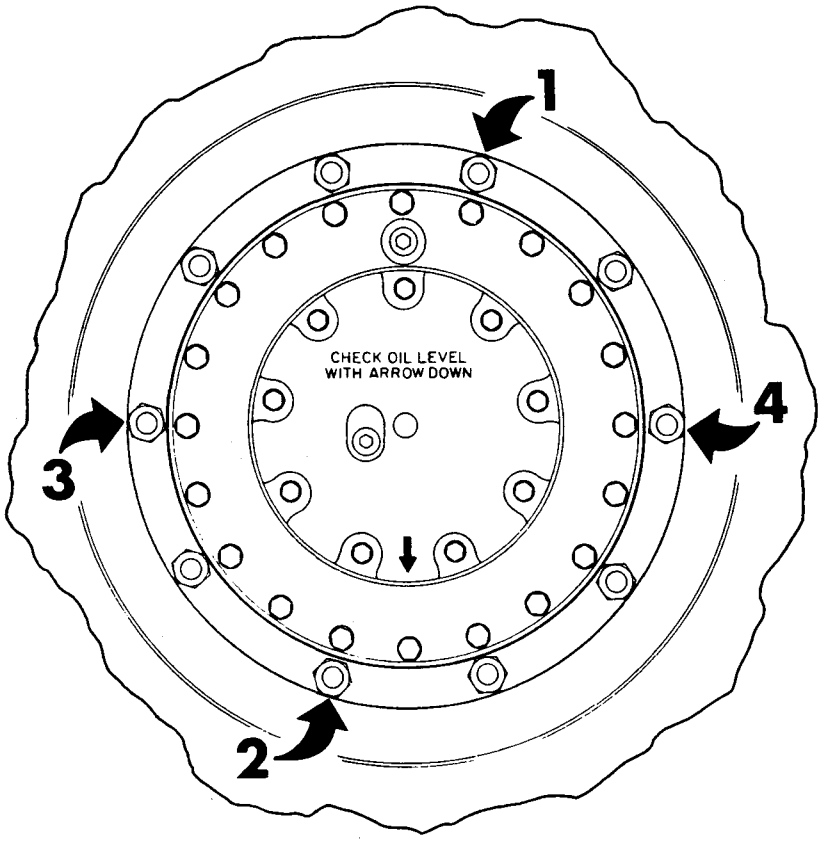
After draining, axles should be flushed. Replace drain plugs and fill axles to proper level with a light flushing oil. Operate the axles for a short period of time, then drain. Be sure to drain all of the flushing oil before refilling with new oil. Inspect the magnetic drain plug for metal particles or other foreign matter indicative of wear or possible failure. When refilling, cleanliness is extremely important.

NOTE: DEXRON II® is not compatible with graphic friction plate material unless it meets the approved C-3 specifications.

***DEXRON is a registered trade mark of General Motors Corporation.**

CLARK

CLARK RECOMMENDED WHEEL MOUNTING TORQUE



PROPER TIGHTENING PROCEDURE

(Use Tightening Sequence Shown)

Thread Size	Flat Nuts and Hardened Washer	Flat Nuts with Rim Clamps	Spherical Nuts
5/8 (.625)	175 - 190 Lbs. Ft. [240 - 260 N.m]	——	240 - 275 Lbs. Ft. [325 - 375 N.m]
3/4 (.750)	300 - 330 Lbs. Ft. [410 - 450 N.m]	250 Max. Lbs. Ft. [340 N.m]	450 - 500 Lbs. Ft. [610 - 680 N.m]
7/8 (.875)	475 - 525 Lbs. Ft. [645 - 710 N.m]	350 Max. Lbs. Ft. [475 N.m]	600 - 700 Lbs. Ft. [815 - 950 N.m]
1 (1.000)	725 - 800 Lbs. Ft. [985 - 1085 N.m]	——	750 - 900 Lbs. Ft. [1015 - 1220 N.m]

APPROVED BY AXLE ENGINEERING
7 MARCH 1980

EXPLODED VIEWS

To supplement the illustrations provided in the overhaul section of the manual, exploded view illustrations are supplied. Legends, keyed to the index numbers on the illustrations, are adjacent to the illustrations to aid in parts identification on the axles. The exploded views are as follows:

Fig. A — Drive Axle Assembly

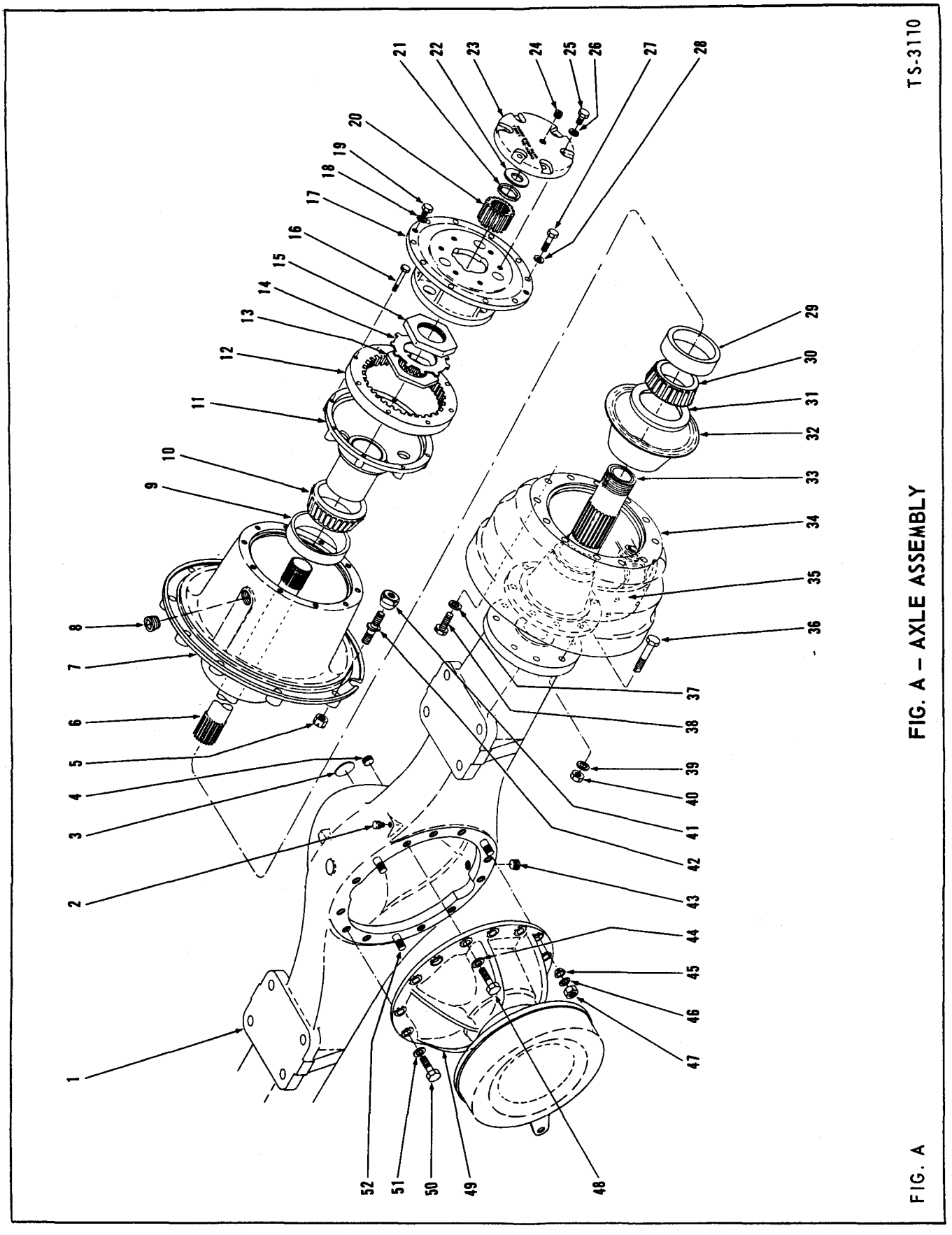
Fig. B — Differential and Carrier Assembly

Fig. C — Service Brake Assembly

Fig. D — Planet Carrier Assembly

The following compounds, or their equivalent, are required for the overhaul of these axles:

Material	Use
Lubriplate	Apply to lips of all oil seals at reassembly.
Mixture of Red Lead and Linseed Oil	Paint ring gear teeth to check for proper differential gear and pinion engagement.
Never-Seez Compound	Apply to eccentric anchor pins of brake.
Permatex No. 2	Used for numerous sealing applications.


TS-3110
FIG. A – AXLE ASSEMBLY
FIG. A
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AXLE ASSEMBLY

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

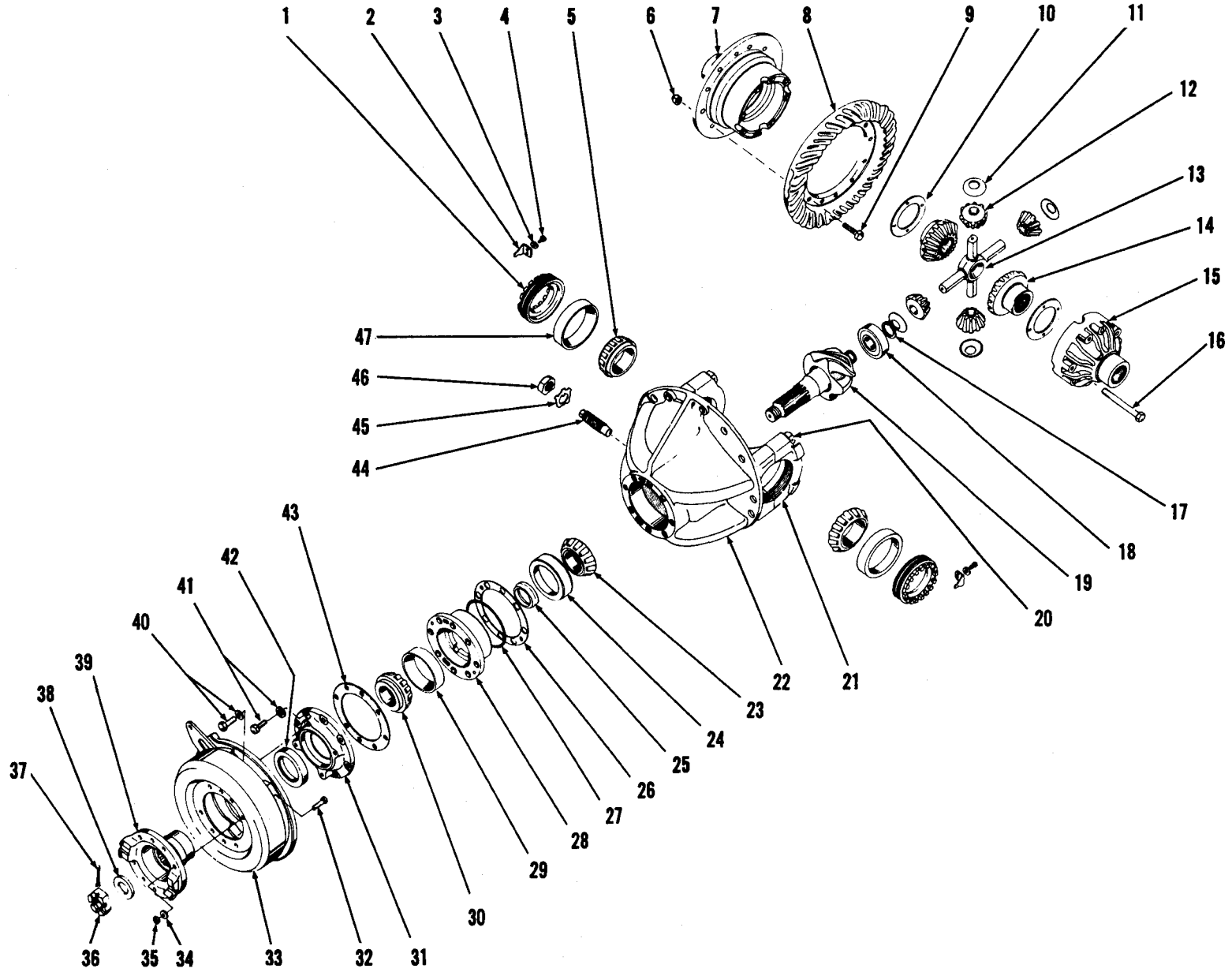


FIG. B – DIFFERENTIAL AND CARRIER ASSEMBLY

FIG. B

TS-3040

DIFFERENTIAL AND CARRIER ASSEMBLY

Item No.	Description	No. Req'd.
1	NUT, Differential Adjusting	2
2	LOCK, Differential Adjusting Nut	2
3	LOCKWASHER, Differential Adjusting Nut Lock	2
4	BOLT, Differential Adjusting Nut Lock	2
5	CONE, Differential Bearing	2
6	NUT, Ring Gear Bolt	12
7	DIFFERENTIAL CASE, Flange Half	1
8	RING GEAR	1
9	BOLT, Ring Gear	12
10	WASHER, Side Gear Thrust	2
11	WASHER, Differential Pinion Thrust	4
12	PINION, Differential	4
13	SPIDER, Differential	1
14	GEAR, Differential Side	1
15	DIFFERENTIAL CASE, Plain Half	1
16	BOLT AND NUT, Differential Case	8
17	OMIT – Not applicable this model	–
18	BEARING, Inner Pinion	1
19	PINION	1
20	BOLT AND WASHER, Differential Carrier Cap	4
21	CAP, Differential Carrier – See 22	1
22	CARRIER ASSY, Differential	1
23	CONE, Center Pinion Bearing	1
24	CUP, Center Pinion Bearing	1
25	SPACER, Pinion Bearing	1
26	SHIM, Pinion Bearing Cage – .004", .007", .010"	AR
27	OMIT – Not applicable this model	–
28	CAGE ASSY, Pinion Bearing	1
29	CUP, Outer Pinion Bearing	1
30	CONE, Outer Pinion Bearing	1
31	RETAINER, Pinion Oil Seal	1
32	BOLT, Brake Drum to Flange	8
33	PARKING BRAKE ASSY	1
34	LOCKWASHER, Brake Drum to Flange	8
35	NUT, Brake Drum to Flange	8
36	NUT, Pinion Shaft	1
37	COTTER, Pinion Shaft Nut	1
38	WASHER, Pinion Shaft	1
39	FLANGE, Companion	1
40	BOLT AND LOCKWASHER, Brake Attaching	4
41	BOLT AND LOCKWASHER, Oil Seal Retainer	8
42	SEAL, Pinion Oil	1
43	GASKET, Pinion Oil Seal	1
44	SCREW, Differential Thrust	1
45	LOCK, Thrust Screw	1
46	NUT, Differential Thrust Screw	1
47	CUP, Differential Bearing	1

AR – As Required

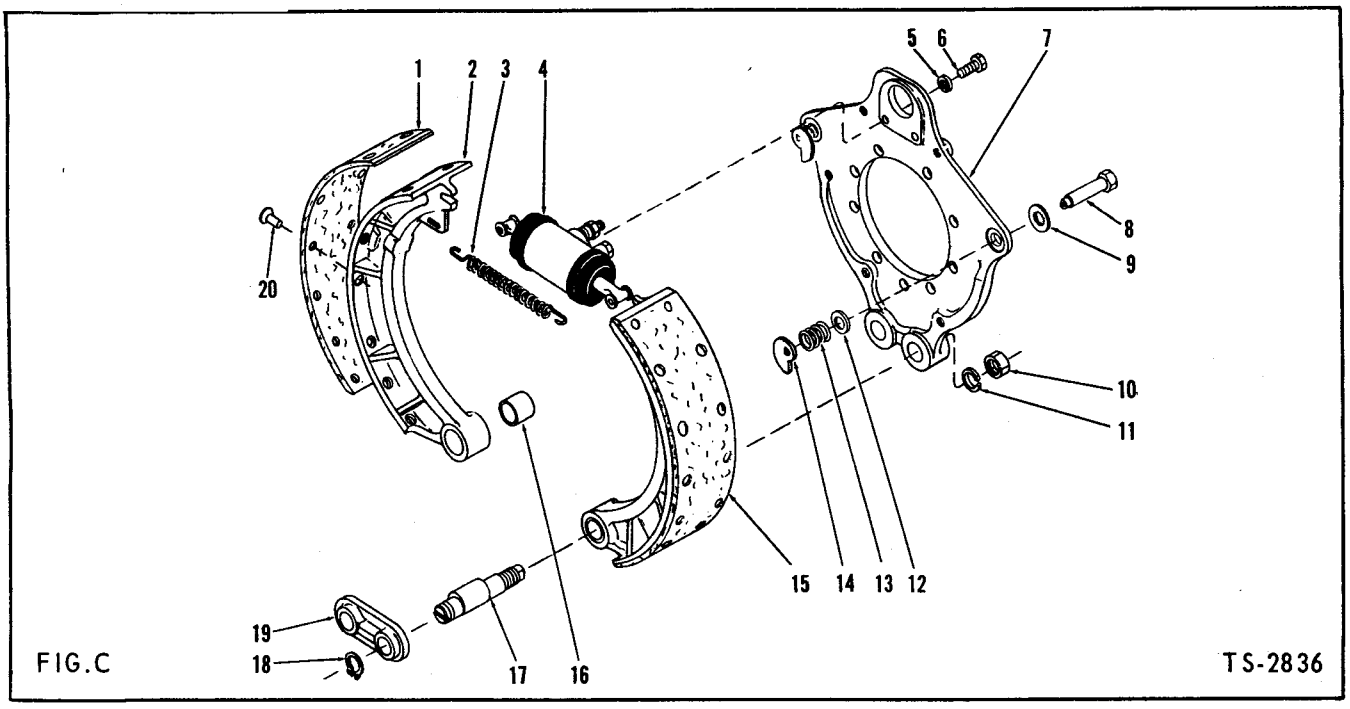


FIG.C TS-2836

BRAKE ASSEMBLY

Item No.	Description	No. Req'd.
1	LINING, Brake Shoe	2
2	SHOE, Brake	2
3	SPRING, Brake Shoe Return	1
4	WHEEL CYLINDER	1
5	LOCKWASHER, Wheel Cylinder Mounting	2
6	BOLT, Wheel Cylinder Mounting	2
7	SPIDER ASSY, Brake	1
8	PIN ASSY, Brake Shoe Adjusting	2
9	WASHER, Brake Shoe Adjusting Pin	2
10	NUT, Anchor Pin	2
11	LOCKWASHER, Anchor Pin Nut	2
12	WASHER, Cam Spring	2
13	SPRING, Brake Shoe Adjusting	2
14	CAM, Shoe Adjusting	2
15	SHOE ASSY, Brake	2
16	BUSHING, Brake Shoe	2
17	PIN, Brake Shoe Anchor	2
18	RING, Anchor Pin Retaining	2
19	STRUT, Anchor Pin	1
20	RIVET, Lining to Shoe	28

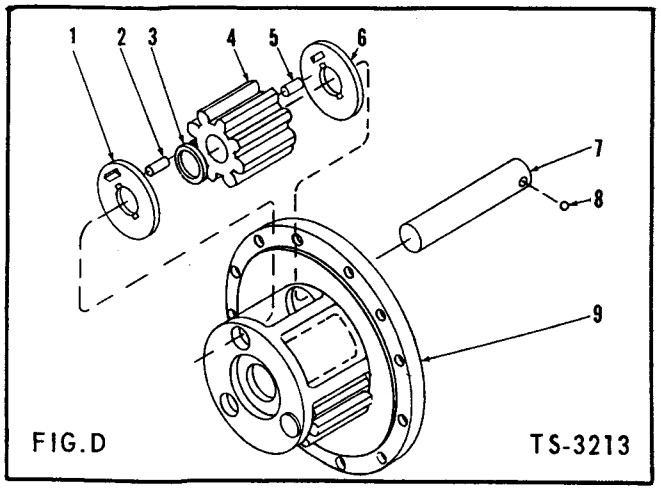


FIG.D TS-3213

PLANET SPIDER ASSEMBLY

Item No.	Description	No. Req'd.
1	WASHER, Pinion Thrust	3
2	ROLLER, Pinion Needle	75
3	SPACER, Pinion Roller	3
4	PINION, Planet	3
5	ROLLER, Pinion Needle	75
6	WASHER, Pinion Thrust	3
7	SHAFT, Pinion	1
8	BALL, Pinion Shaft	3
9	SPIDER, 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. Mount axle on steel horses or on V-blocks. If axle is mounted on horses, invert it from its normally installed position and allow axle housing mounting pads to rest on crossbars of horses to provide necessary rigidity.

CAUTION: Cleanliness is of extreme importance 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 hub and from axle housing to drain axle (Fig. 1).

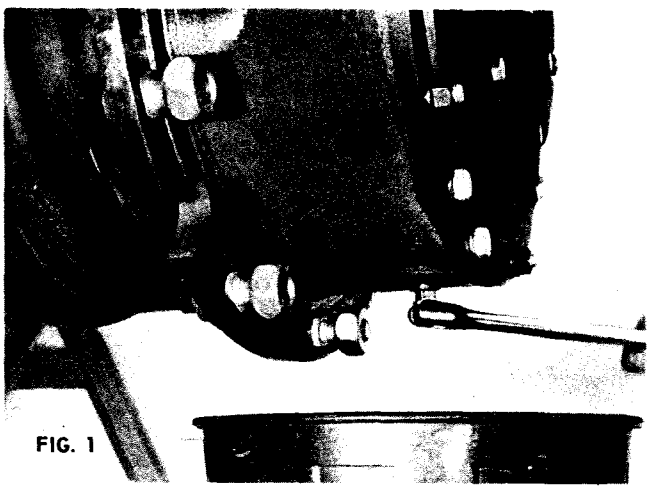


FIG. 1

2. Remove bolts and washers securing sun gear thrust cap. Remove thrust cap (Fig. 2). If damaged, remove sun gear thrust cap washer from thrust cap.

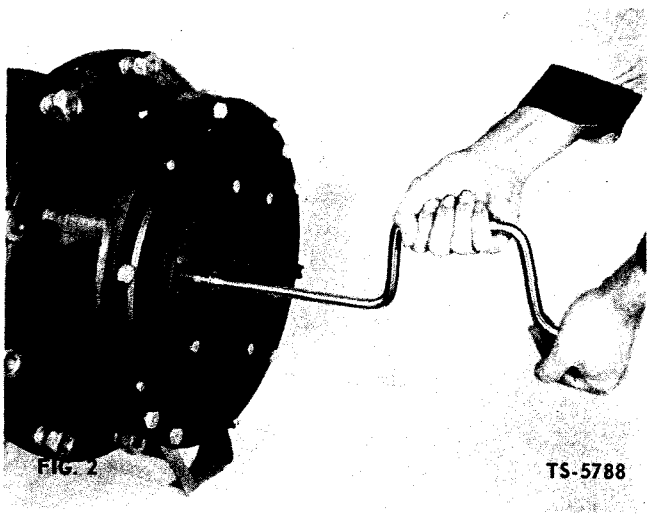


FIG. 2 TS-5788

3. Remove sun gear retaining ring and remove sun gear (Fig. 3).

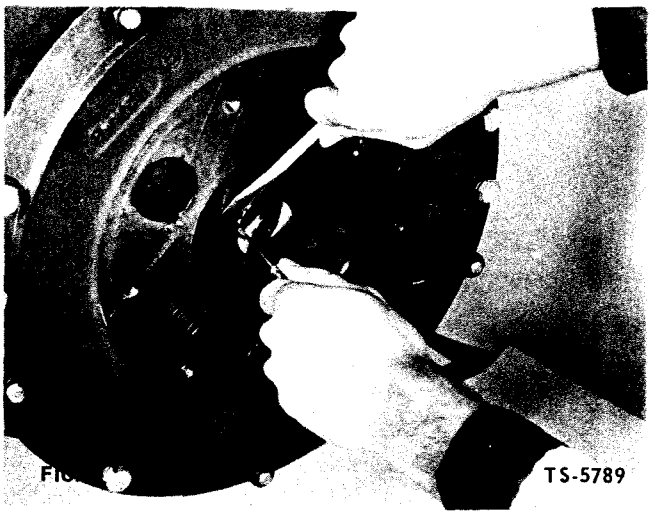


FIG. 3 TS-5789

4. Remove bolts, washers, and stud nuts from planet spider assembly (Fig. 4).

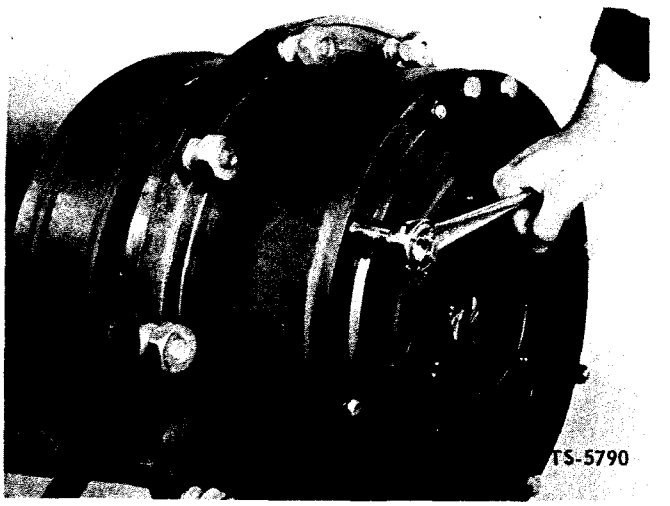


FIG. 4 TS-5790

5. Install two mounting bolts in puller holes to pull planet spider assembly from hub assembly (Fig. 5).

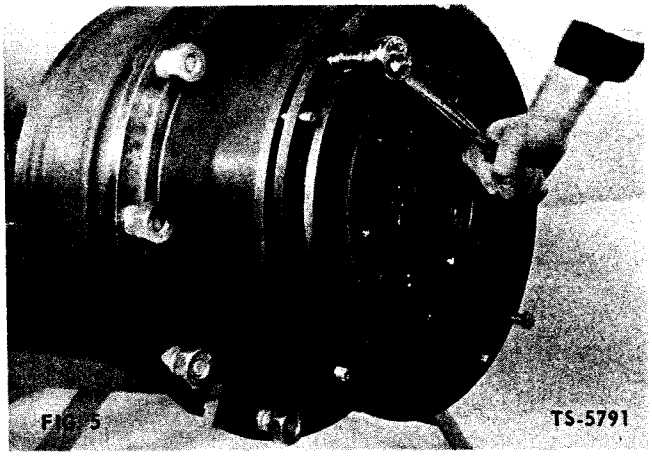
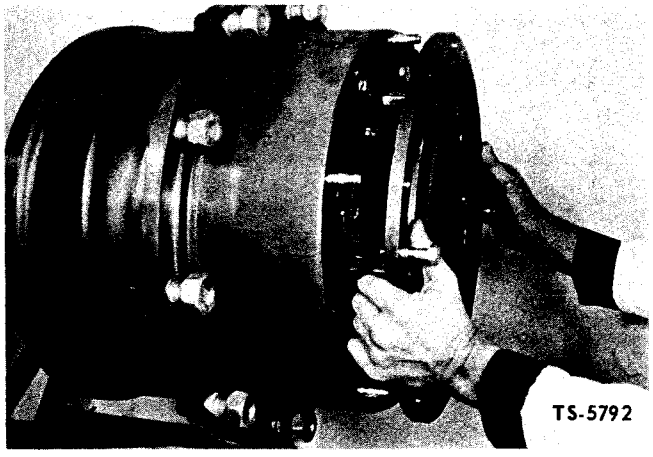


FIG. 5

6. Remove planet spider assembly (Fig. 6). Take care not to lose tapered dowels used to align spider to studs.



7. Straighten tangs on nut lock as shown in Fig. 7.

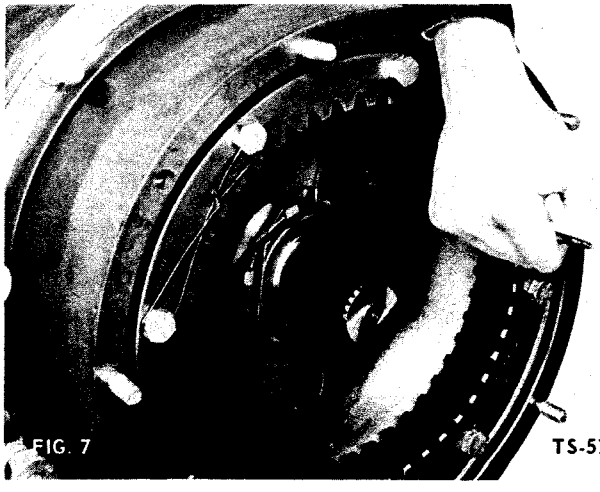


FIG. 7

8. Wrap several turns of .010 inch to .020 inch shim stock around end of axle shaft to protect shaft splines (Fig. 8). Install special spindle nut (Clark Part No. 945940) socket on outside wheel nut. Tighten guide screws lightly against shim stock.

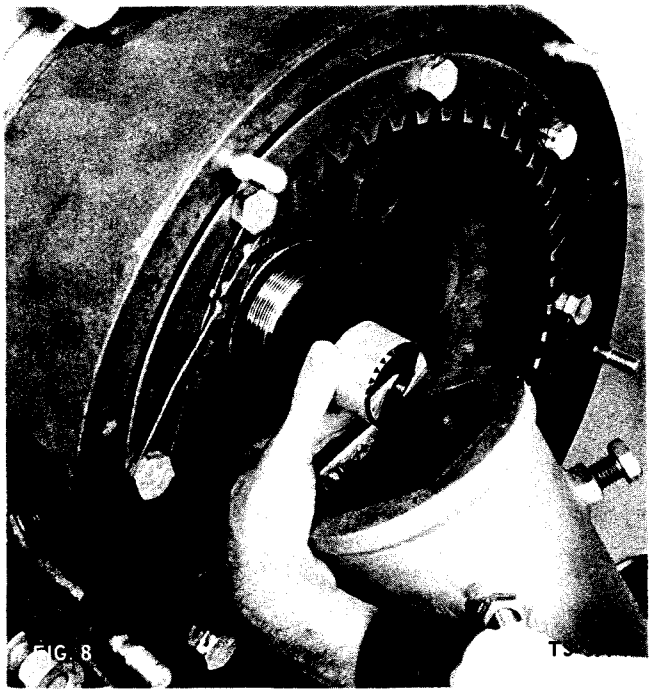


FIG. 8

9. Remove outer spindle nut, spindle nut lock, and inner spindle nut (Fig. 9).

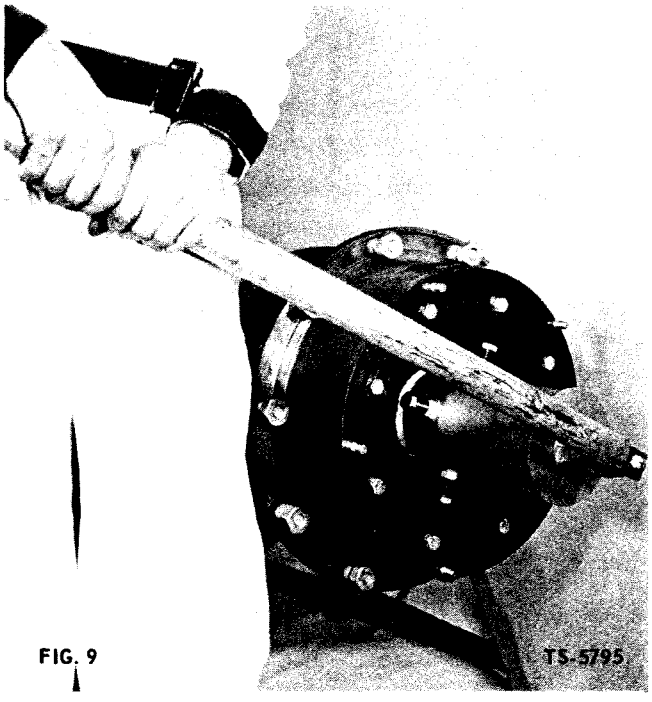
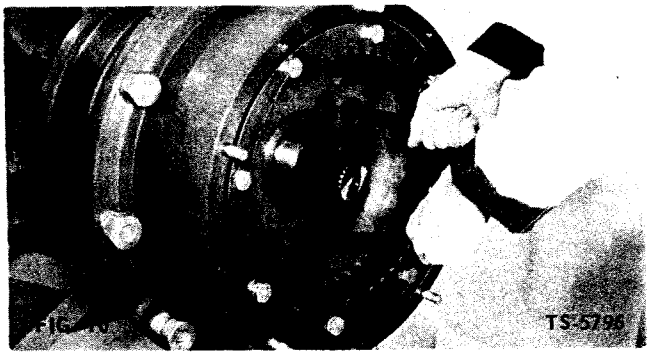
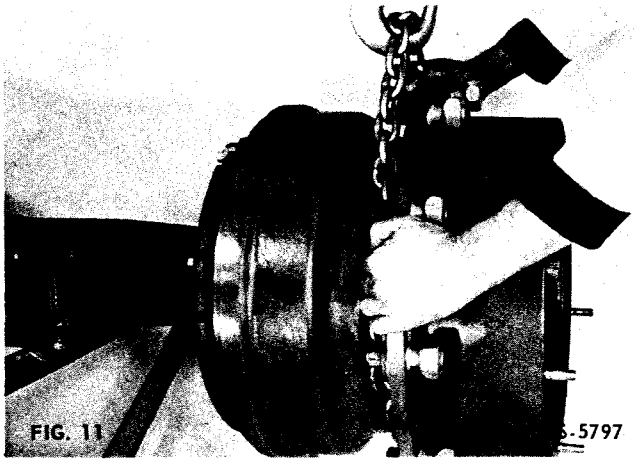


FIG. 9

10. Support weight of brake drum and hub assembly with hoist. Remove internal gear and hub from spindle (Fig. 10). In some cases, it will be necessary to use pry bars as shown.

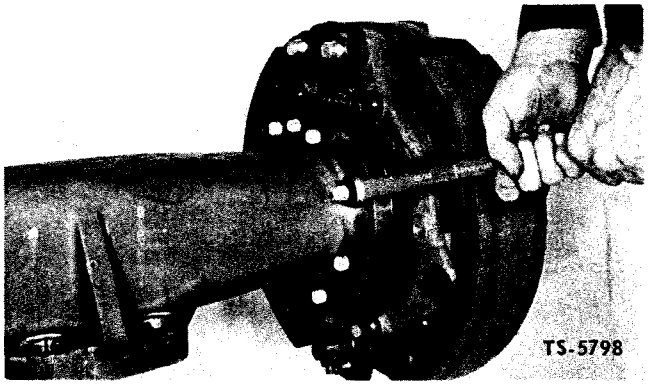


11. Pull straight out on brake drum and hub assembly to remove it from axle (Fig. 11).

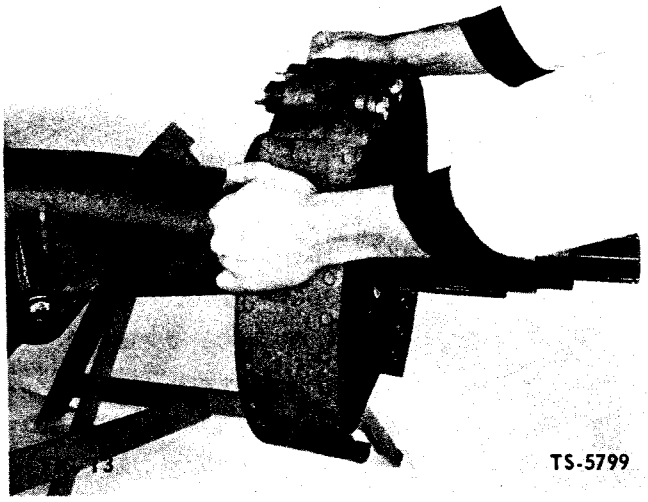


12. Remove bolts and nuts securing brake spider and spindle to axle housing (Fig. 12).

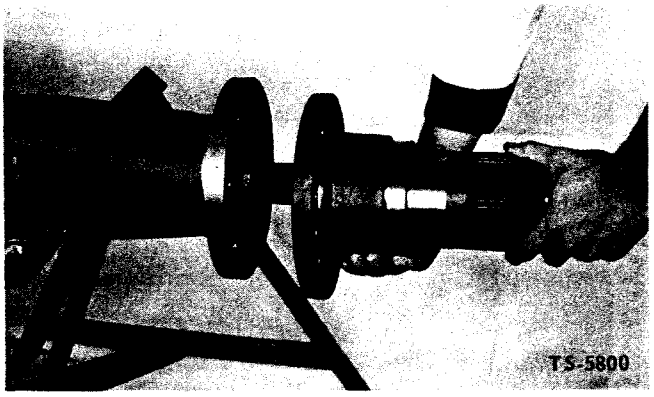
NOTE: Some models of axles have stamped brake discs instead of cast brake spiders, and spindle is integral with axle housing.



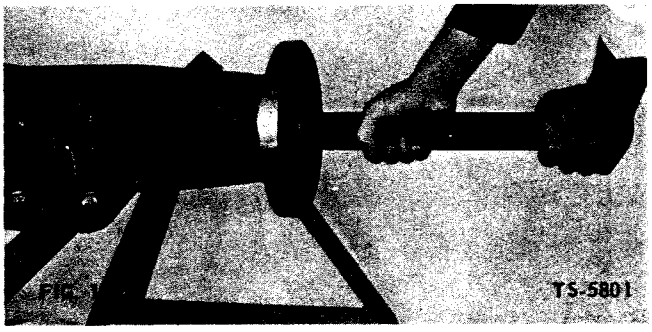
13. Remove brake assembly from the spindle assembly (Fig. 13).



14. Pull straight out on spindle assembly to remove it from axle housing (Fig. 14).



15. Pull straight out to remove axle shaft assembly (Fig. 15).



16. Disassemble opposite side of axle following instructions given in steps 2 through 15.

NOTE: To remove differential,it is not necessary to fully disassemble axle ends. Axle shafts can be removed by removing sun gear thrust cap (Fig. 2) and pulling assembled sun gear and axle shaft from axle (Fig.16). Removal of axle shaft will allow differential to be removed.

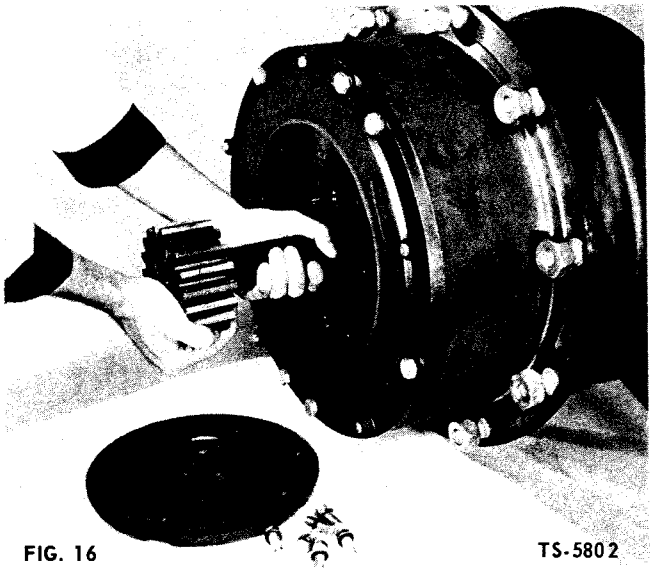
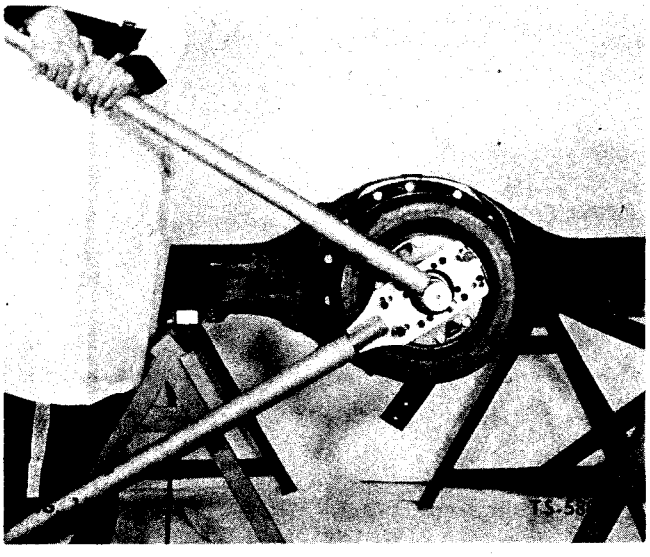


FIG. 16 TS-5802

NOTE: Steps 17 through 22 are necessary only if axle assembly is equipped with parking brake. If parking brake is not provided, proceed to step 23.

17. Remove cotter pin from companion flange nut. Install companion flange retaining tool on companion flange with 1/2-20 bolts. Remove nut securing companion flange to pinion shaft (Fig. 17).



18. Pull assembled parking brake drum and companion flange from differential pinion shaft (Fig. 18).

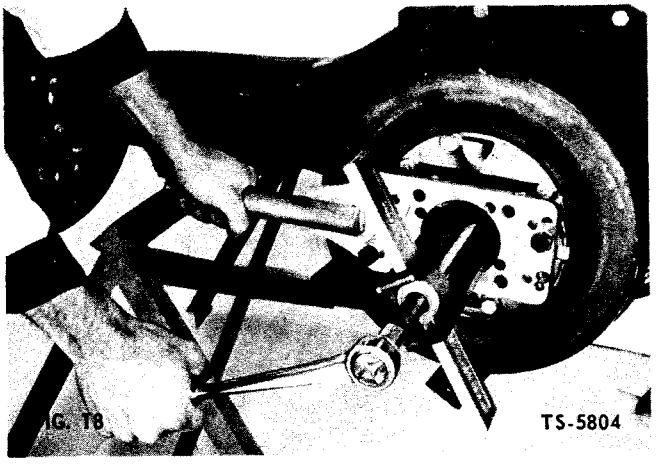
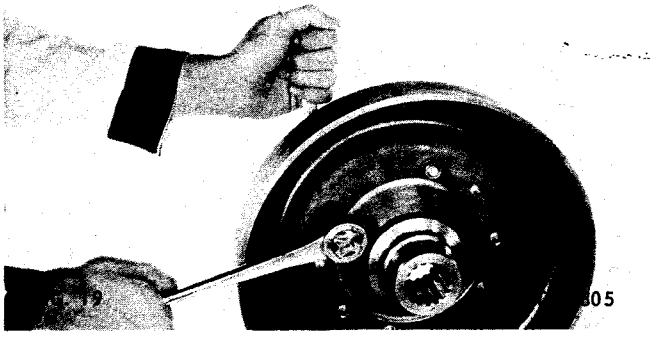


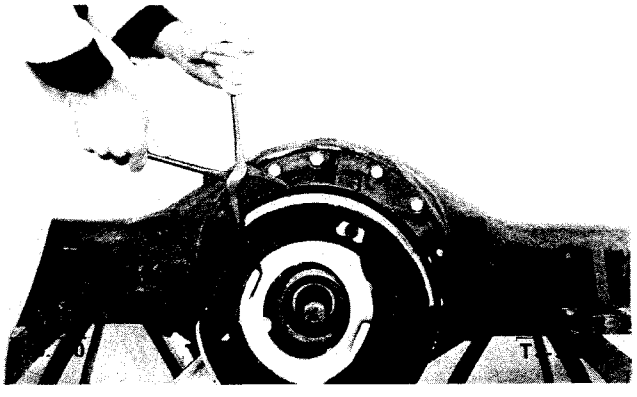
FIG. 18 TS-5804

19. If brake drum or companion flange is damaged, remove bolts, nuts, and lockwashers securing parking brake drum to companion flange (Fig. 19).

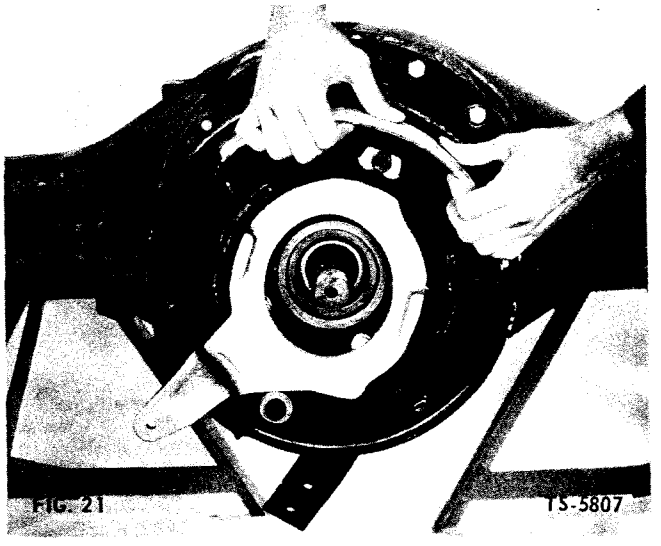
NOTE: Some brake drums have bolts welded to companion flange. On these units remove nuts and lockwashers securing parking brake drum to companion flange.



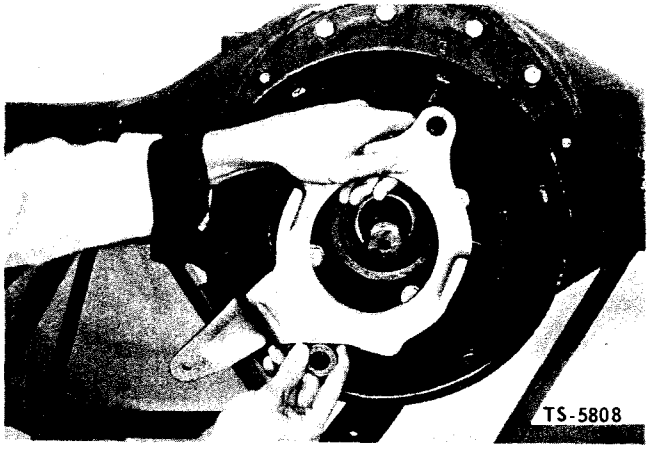
20. Use brake spring pliers to remove brake shoe return springs from parking brake shoes (Fig. 20).



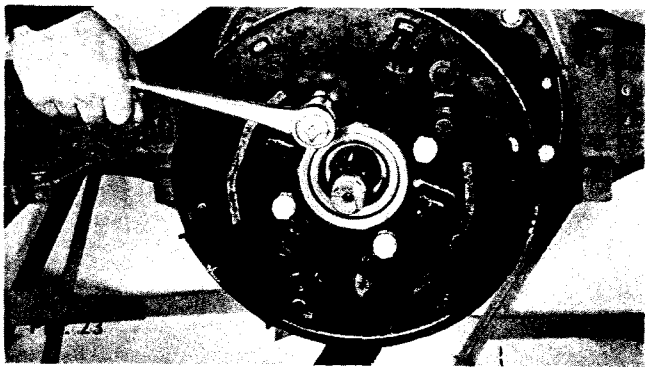
21. Remove brake shoes (Fig. 21).



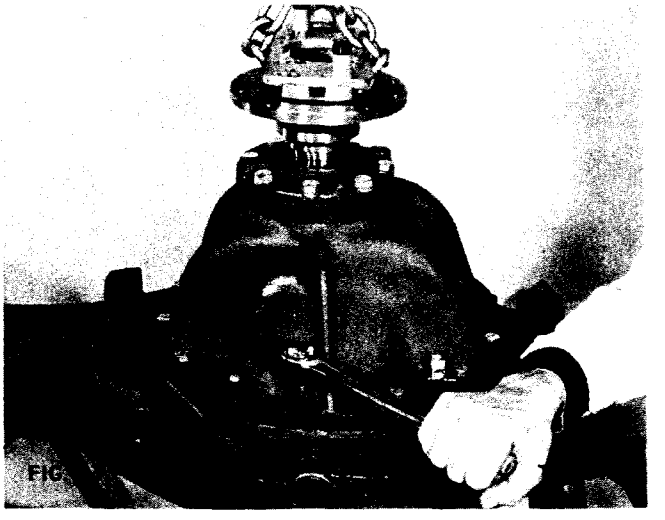
22. Remove operating cam lever and brake actuating roller (Fig. 22).



23. Remove bolts securing brake backing plate to differential (Fig. 23). Temporarily reinstall companion flange on pinion shaft with nut and washer to facilitate hoisting differential.



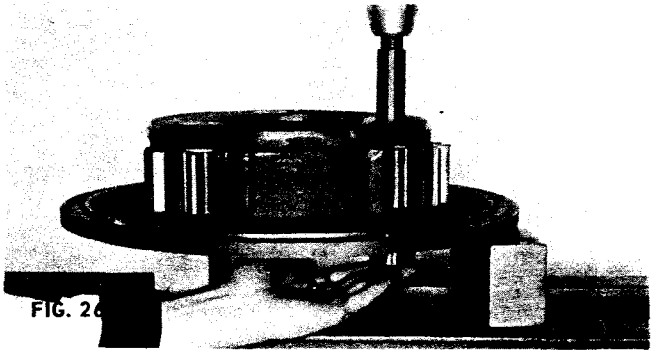
24. Support weight of differential with hoist and remove bolts, nuts, and washers securing differential carrier to axle housing (Fig. 24).



25. Carefully hoist differential from housing (Fig. 25). It may be necessary to tap housing with soft mallet to break seal.

Disassembly of Planet Spider Assembly

1. Place planet spider assembly in press as shown in Fig. 26, and press out pinion shaft securing pinion to spider. Take care to catch pinion shaft ball released by shaft movement.



2. Carefully remove pinion shaft, planet pinion, pinion thrust washers, pinion rollers, and pinion roller spacer (Fig. 27). Rollers will drop from pinions. Take care to prevent losing them.

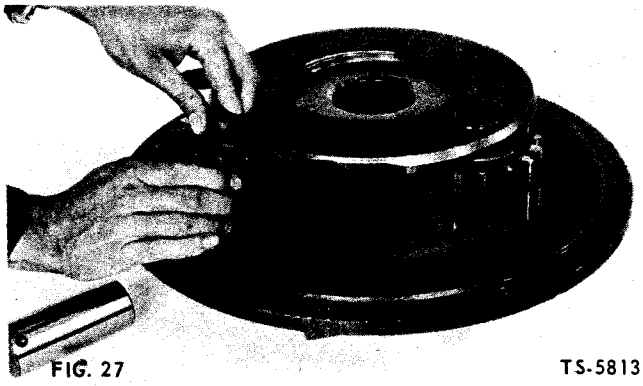


FIG. 27 TS-5813

Disassembly of Hub and Drum Assembly

1. Matchmark hub and drum to insure proper reassembly (Fig. 28).

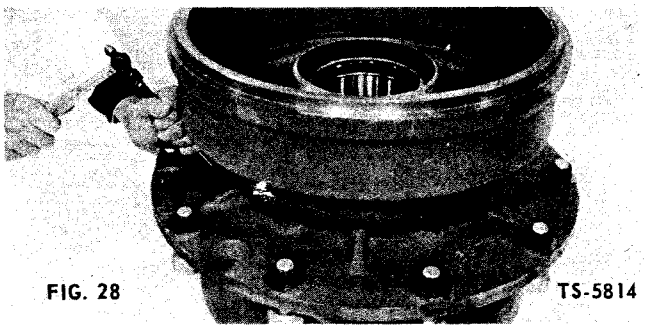


FIG. 28 TS-5814

2. Cut lockwires and remove bolts securing brake drum to hub (Fig. 29). Remove brake drum and oil catcher.

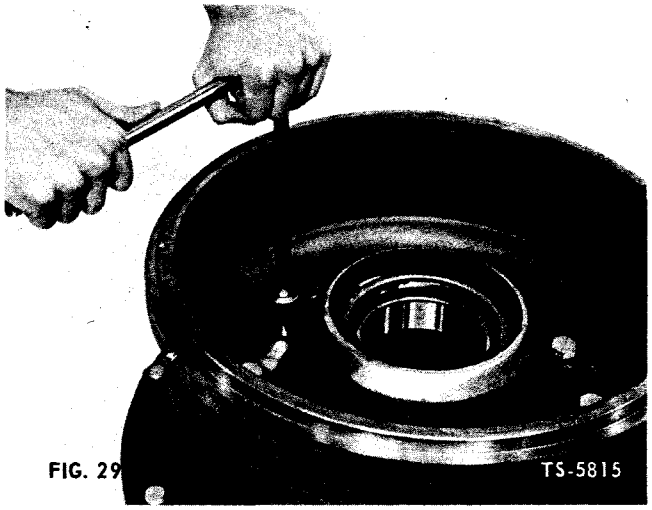
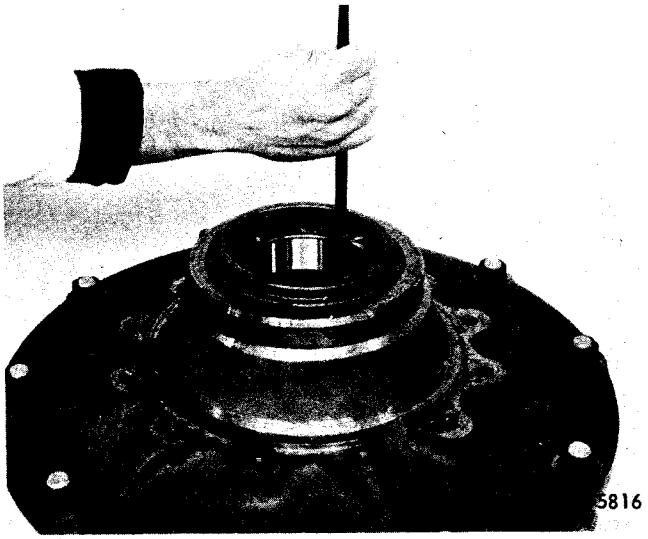


FIG. 29 TS-5815

3. Pry out oil seal (Fig. 30).



TS-5816

4. Lift out bearing cone (Fig. 31).

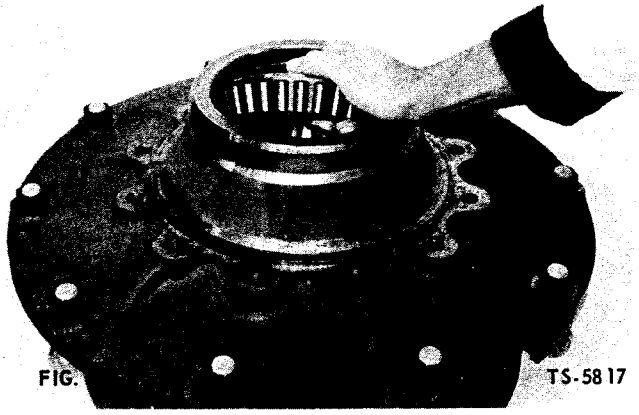
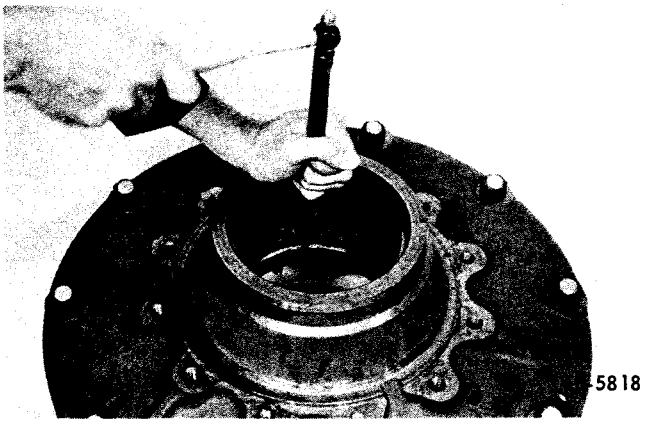


FIG. TS-5817

5. If replacement of the bearing cups is required, drive out cups with a soft drift (Fig. 32). Exercise care to prevent damage to the bearing bores when driving out cups.



TS-5818

Disassembly of Internal Gear and Hub

1. Cut lockwires and remove bolts securing internal gear to hub. Remove internal gear (Fig. 33).

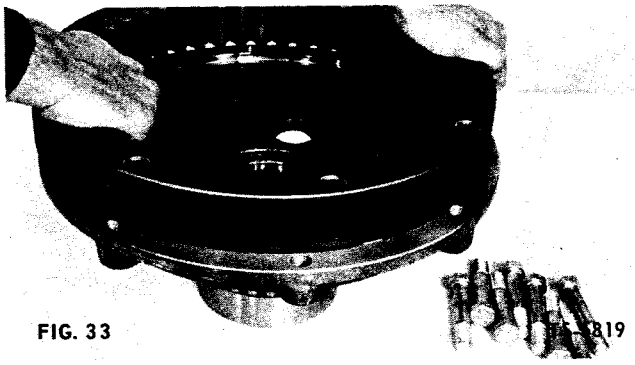


FIG. 33 TS-5819

2. If it is damaged, drive bearing cone from hub (Fig. 34).

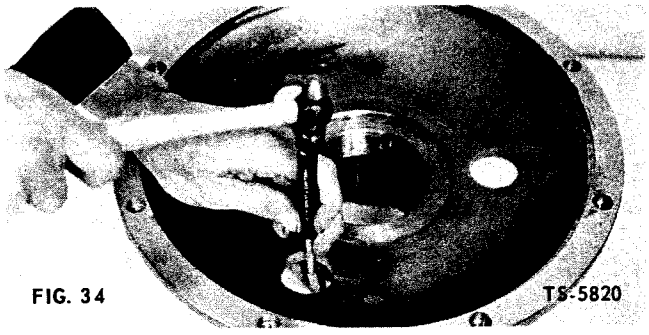


FIG. 34 TS-5820

Disassembly of Brake Assembly

NOTE: Two types of brake assemblies are used on the various axle assemblies covered by this manual. One incorporates a cast spider and the other uses a stamped disc as a backing plate. Instructions for both types are given as follows:

Brakes Using Cast Type Spider

1. Rotate brake shoe adjusting cam to reduce brake return spring tension to a minimum (Fig. 35).

FIG. 35 TS-5821

2. Remove brake shoe return spring with brake spring pliers (Fig. 36).

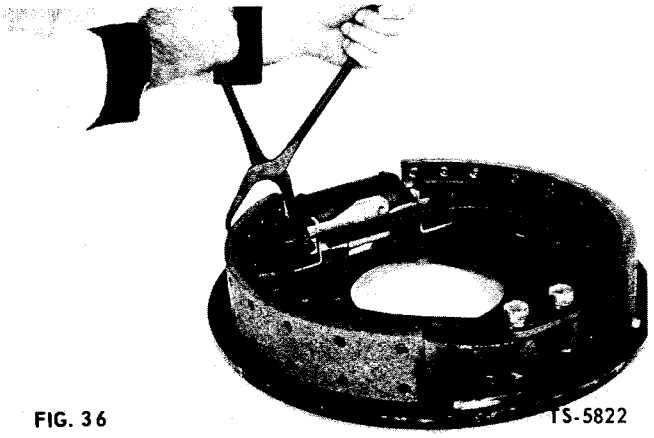


FIG. 36 TS-5822

3. Remove anchor pin retaining ring and strut (Fig. 37).

FIG. 37 TS-5823

4. Remove brake shoes (Fig. 38).

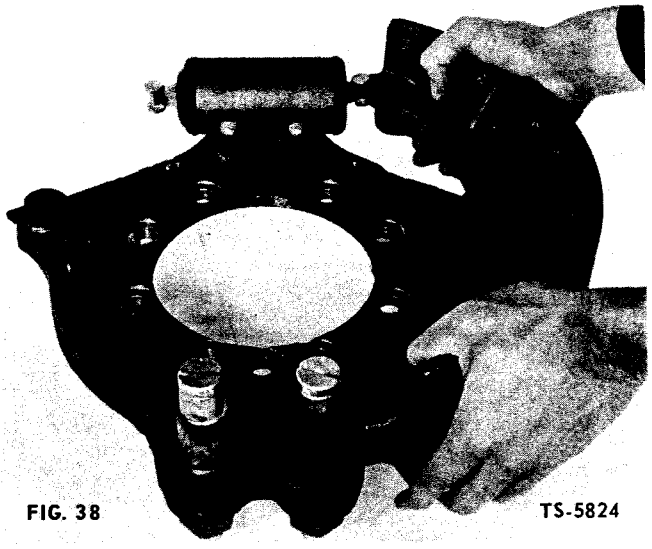


FIG. 38 TS-5824

5. Remove two bolts securing wheel cylinder to brake disc and lift off cylinder (Fig. 39).

FIG. 39 TS-5825

6. If anchor pin removal is necessary, hold pin and remove nut securing pin to brake disc (Fig. 40).

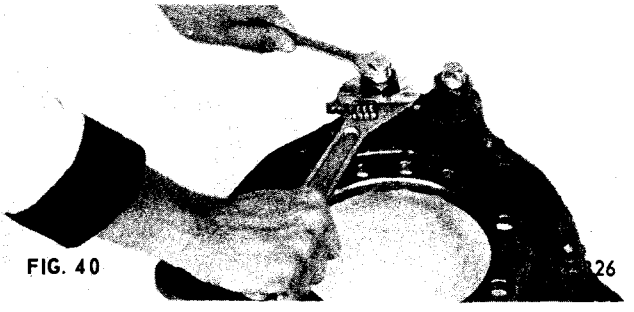


FIG. 40 TS-5826

7. Remove push rods and boots from ends of cylinder. Remove pistons, cups, and spring (Fig. 41).

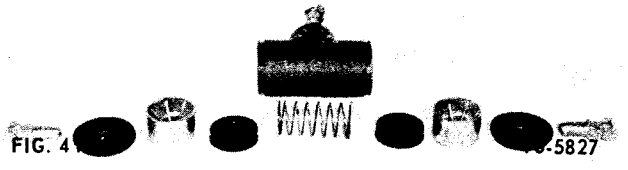


FIG. 41 TS-5827

Brakes Using Stamped Disc as Backing Plate

1. Rotate brake shoe adjusting cam to reduce brake return spring tension to a minimum (Fig. 42).

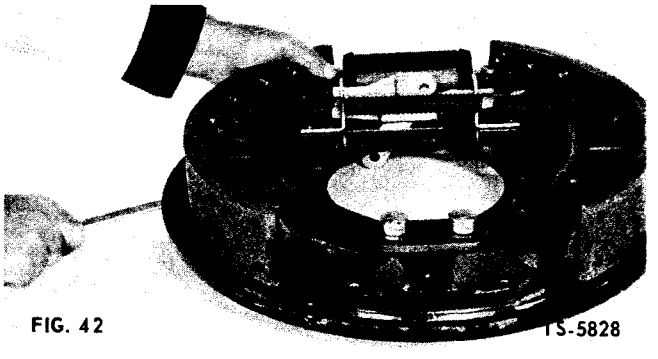


FIG. 42 TS-5828

2. Remove brake shoe return spring with brake spring pliers (Fig. 43).

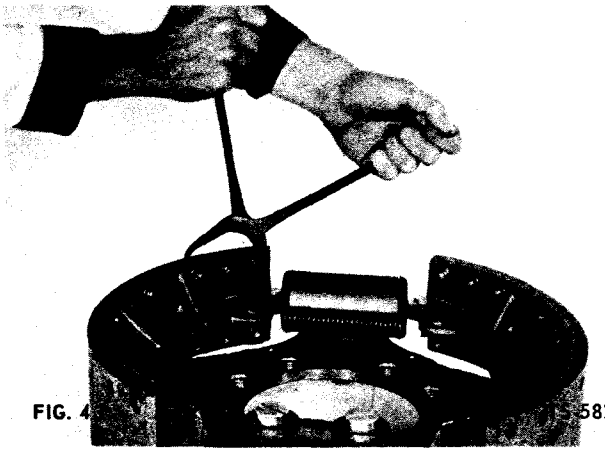


FIG. 43 TS-5829

3. Remove guide pin "C" washers and guide pin washers (Fig. 44).

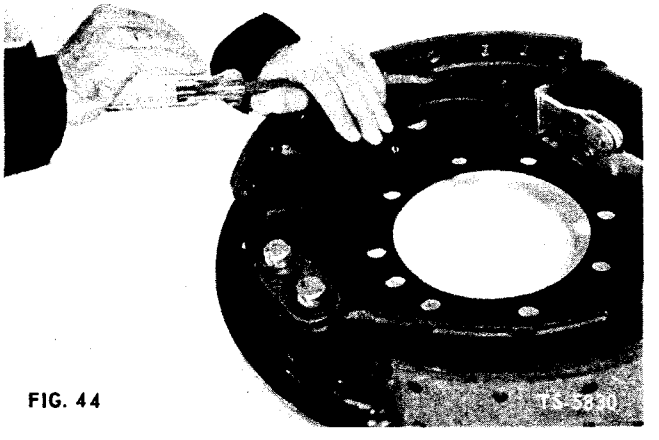


FIG. 44 TS-5830

4. Remove anchor pin "C" washers and strut (Fig. 45). Lift off brake shoes.

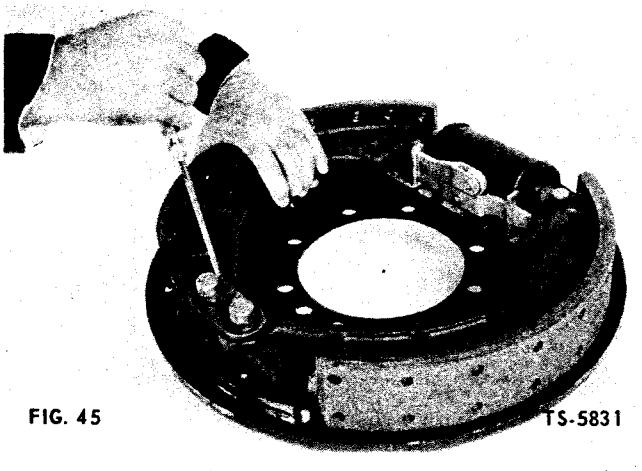


FIG. 45 TS-5831

5. Slide parking brake actuator to one side to disengage it from one of its brackets. Lift parking brake actuator from other bracket (Fig. 46).

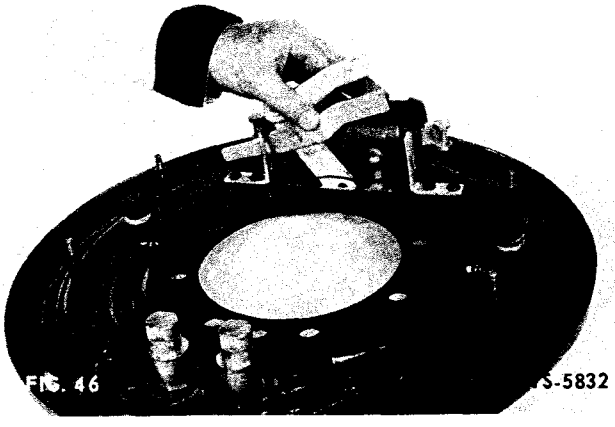


FIG. 46 TS-5832

6. If anchor pin removal is necessary, hold pin and remove nut and lockwasher securing pin to brake disc (Fig. 47).

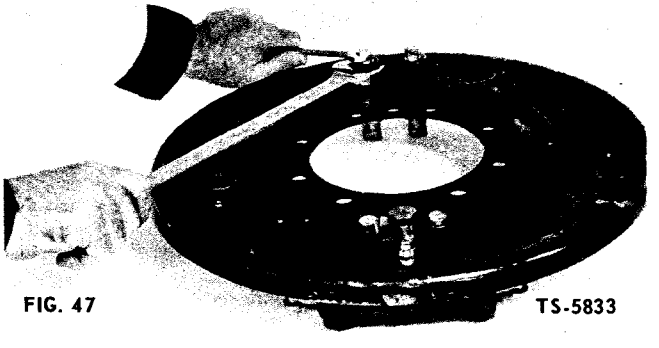


FIG. 47 TS-5833

7. Remove two bolts and lockwashers securing wheel cylinder to brake disc and lift off cylinder (Fig. 48).

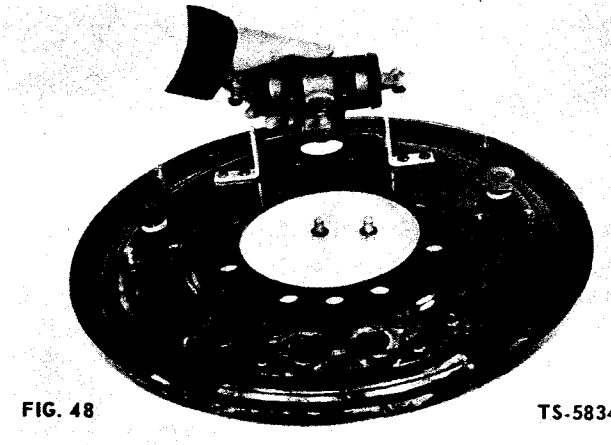


FIG. 48 TS-5834

8. Remove push rods and boots from ends of wheel cylinder. Remove pistons, cups, and spring (Fig. 41).

Disassembly of Differential

1. Mount differential on 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. 49).

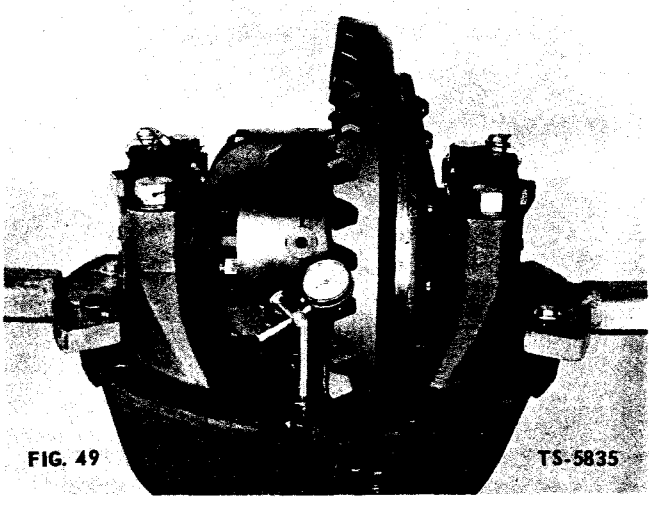


FIG. 49 TS-5835

2. If axle is not equipped with parking brake so that companion flange was not removed previously, install companion flange retainer tool, remove cotter pin, and loosen nut securing flange to pinion shaft in manner similar to that shown in Fig. 17. This will facilitate later companion flange removal.

3. Use center punch to matchmark differential carrier caps to carrier assembly. This is to insure correct match in reassembly (Fig. 50).

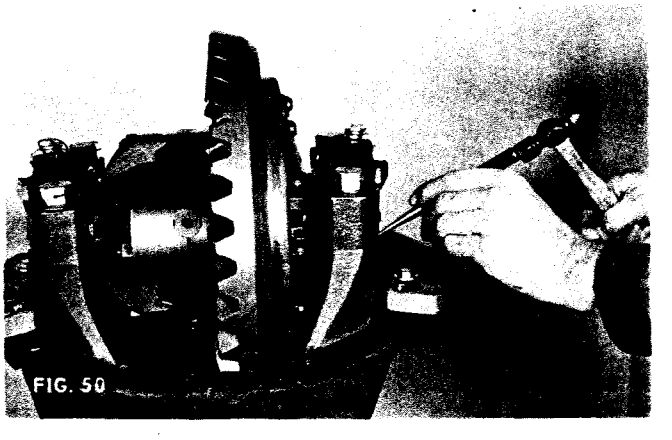


FIG. 50

4. Remove lockwire and differential adjusting nut lock. Remove bearing cap bolts and bearing caps (Fig. 51).

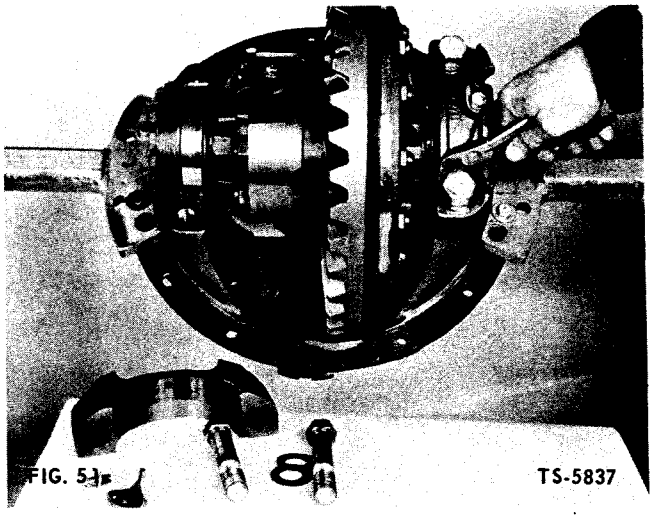


FIG. 51

5. Insert metal bar through differential to facilitate hoisting. Raise ends individually and remove differential adjusting nuts and bearing cups (Fig. 52).

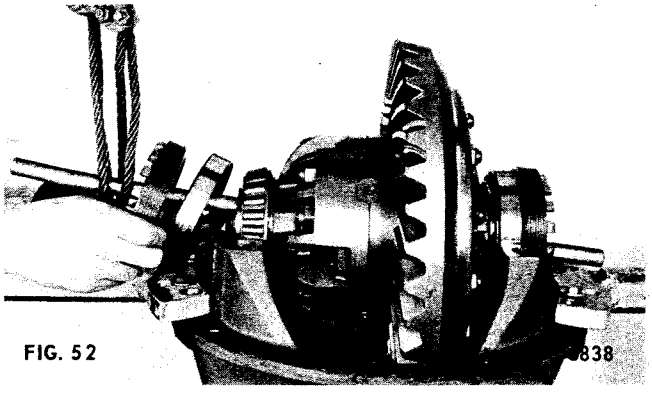


FIG. 52

6. Hoist differential from carrier assembly. Tilt differential assembly slightly to permit ring gear to clear pinion shaft inner bearing boss in carrier assembly (Fig. 53).

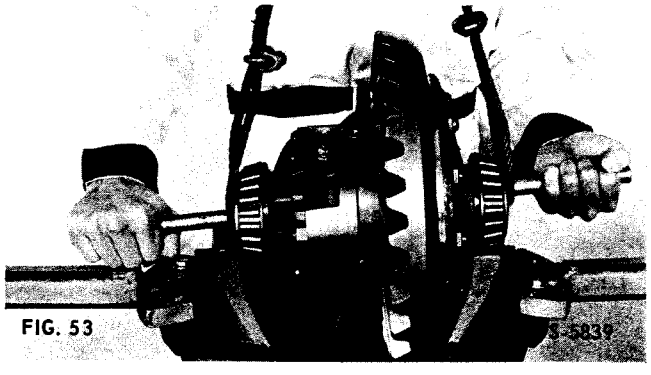
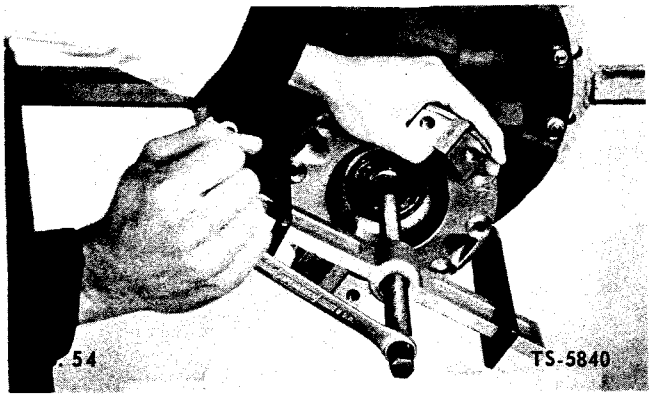
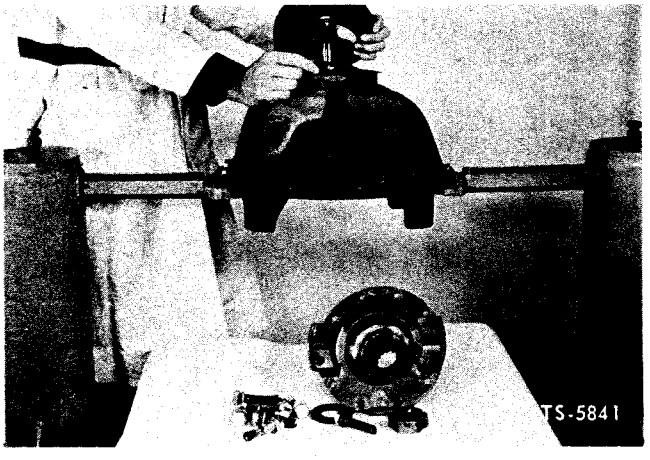


FIG. 53

7. Remove pinion shaft nut that was loosened previously. Remove washer. Remove companion flange from pinion shaft with puller (Fig. 54).



8. Remove bolts securing seal retainer to carrier and remove retainer (Fig. 55). If necessary, tap with soft mallet to break seal between parts. Remove pinion oil seal gasket.



9. Drive pinion oil seal from pinion oil seal retainer (Fig. 56).

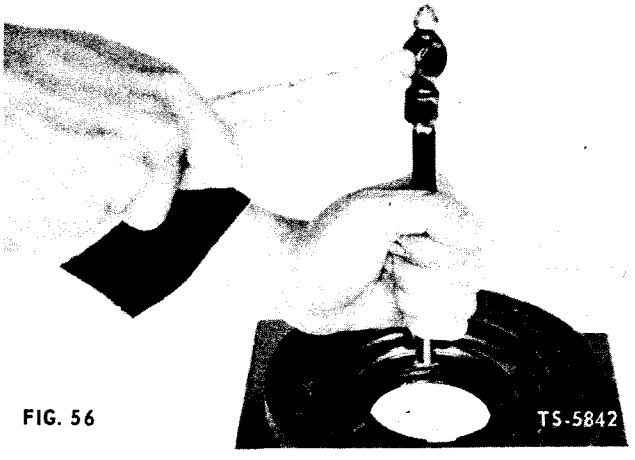


FIG. 56

10. Screw two bolts (3/8-16 threads) in puller holes and pull bearing cage from carrier assembly (Fig. 57). 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.

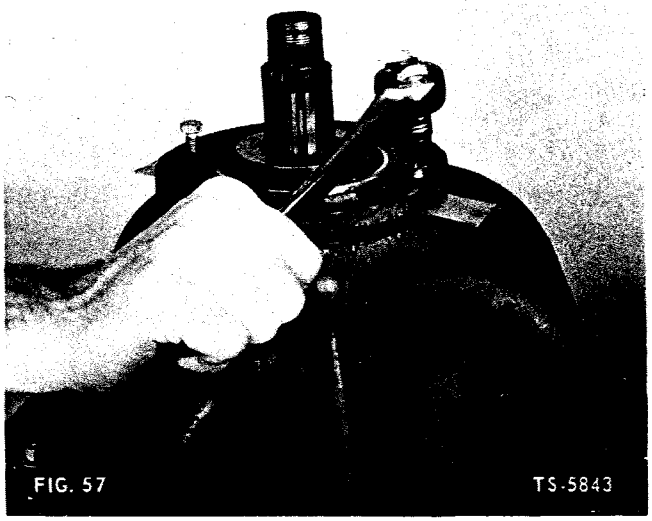


FIG. 57 TS-5843

11. Remove pinion shaft assembly from carrier (Fig. 58). Remove bearing cage shims. Retain bearing cage shim pack intact for possible reuse in reassembly.

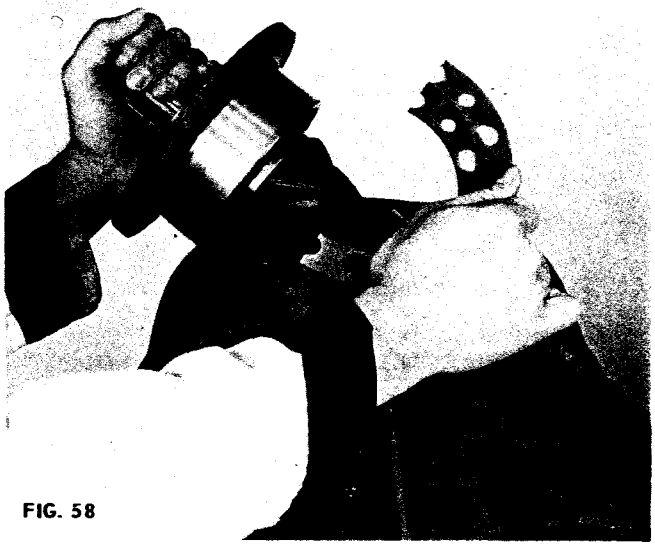


FIG. 58

12. Remove outer pinion bearing cone, bearing cage assembly, and bearing spacer (Fig. 59).

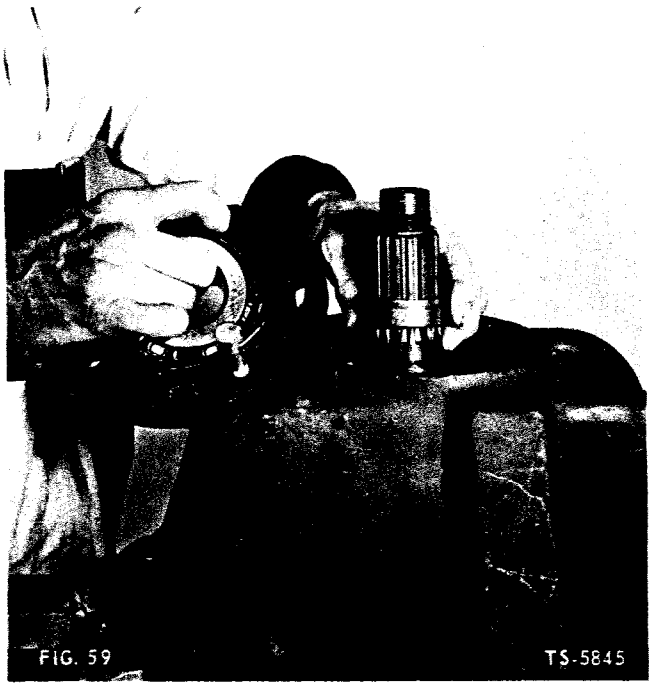


FIG. 59 TS-5845

13. Press pinion shaft assembly and center bearing cup from carrier (Fig. 60).

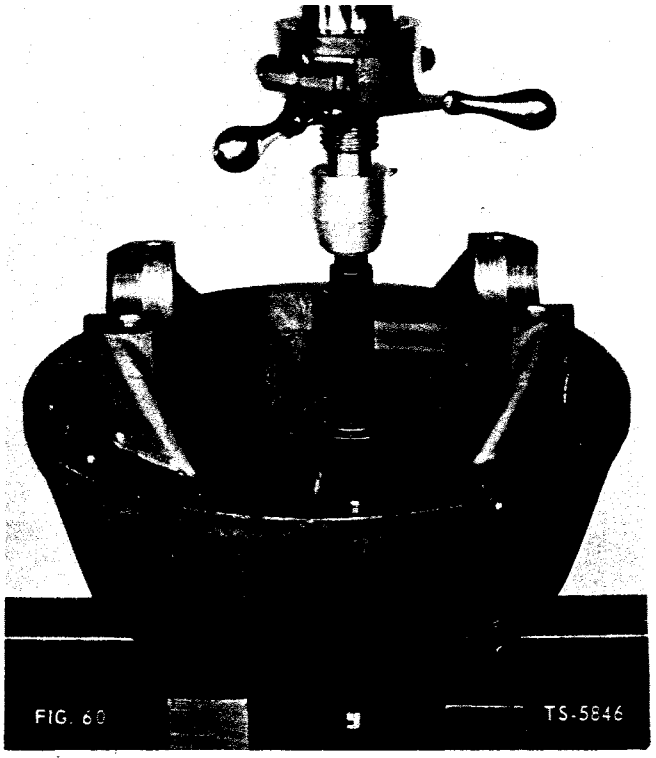


FIG. 60 TS-5846

Disassembly of Pinion Shaft Assembly

1. Press pinion shaft from pinion bearing cage assembly. This will release outer pinion bearing cone. On some axle models, this step was accomplished during removal of bearing cage.

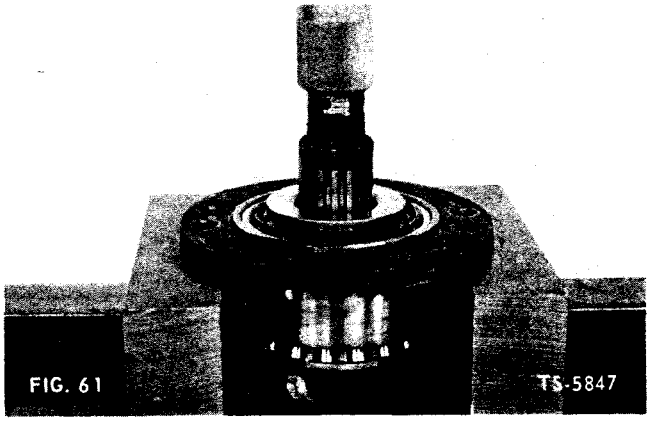


FIG. 61 TS-5847

2. Press center pinion bearing cone from pinion assembly (Fig. 62).

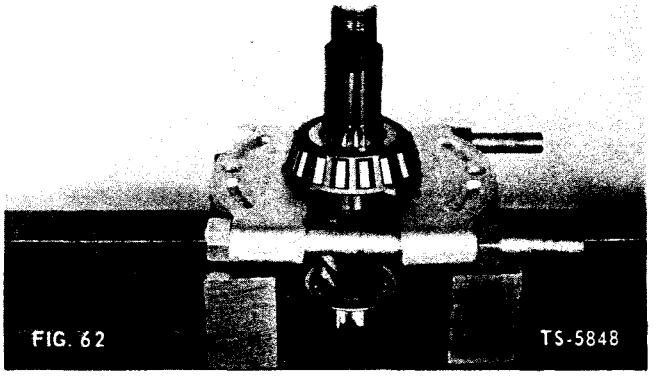


FIG. 62 TS-5848

3. Remove staking and press inner bearing from pinion assembly (Fig. 63).

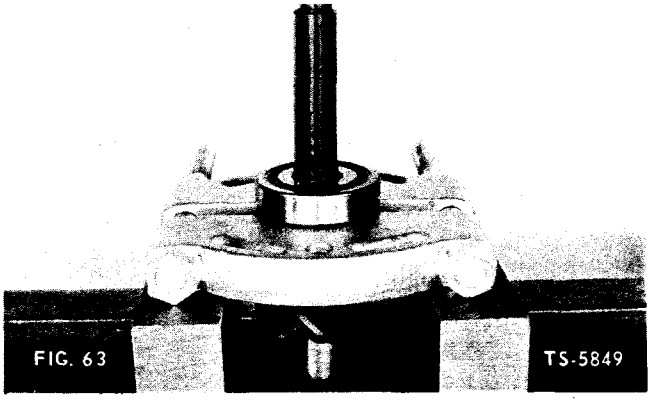


FIG. 63 TS-5849

4. If worn or damaged, drive bearing cups from pinion bearing cage (Fig. 64).

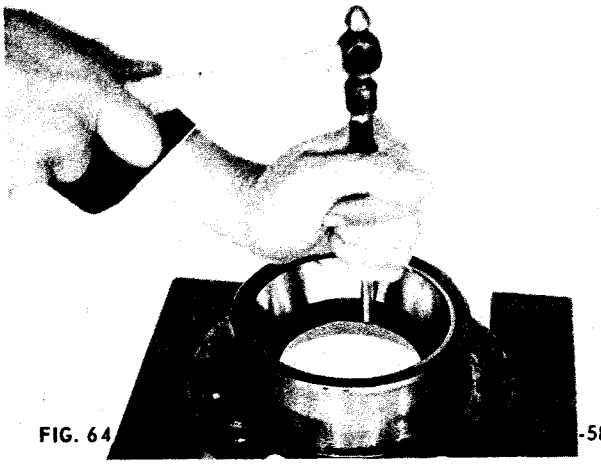


FIG. 64 -5850

Disassembly of Differential Case and Ring Gear

1. Matchmark case halves to insure correct reassembly (Fig. 65).

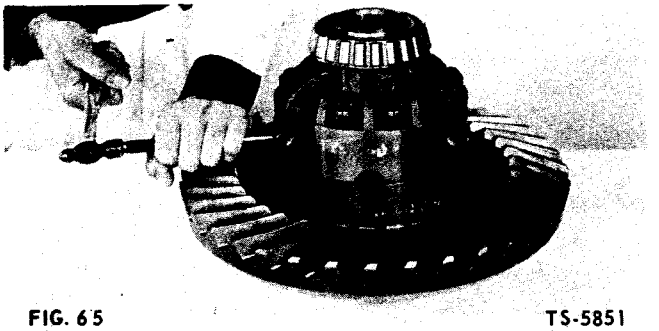


FIG. 65 TS-5851

2. Remove differential case bolts and nuts securing case halves. Lift off case half (Fig. 66). Use soft mallet if necessary to aid removal.

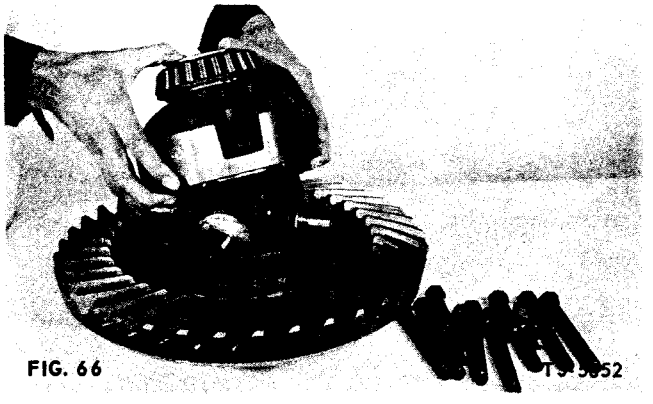


FIG. 66 TS-5852

3. Remove side gears, spider, pinions, and thrust washers (Fig. 67).

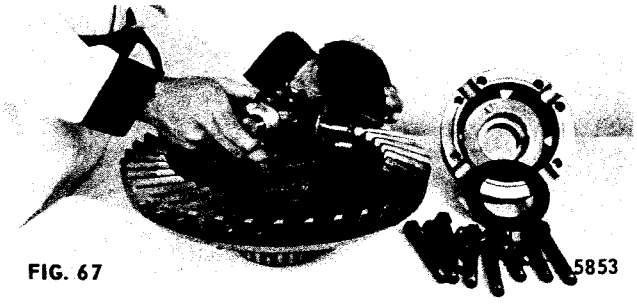
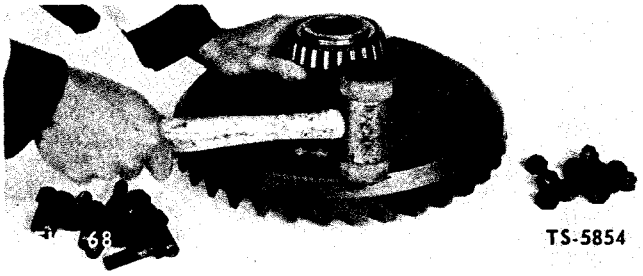


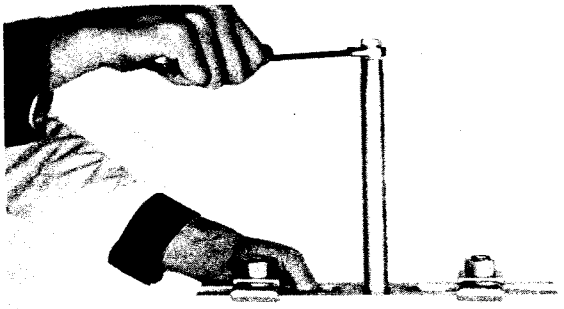
FIG. 67 5853

4. Remove nuts and bolts; remove ring gear (Fig. 68).



68 TS-5854

5. If replacement is required, remove differential bearings with a suitable puller (Fig. 69).



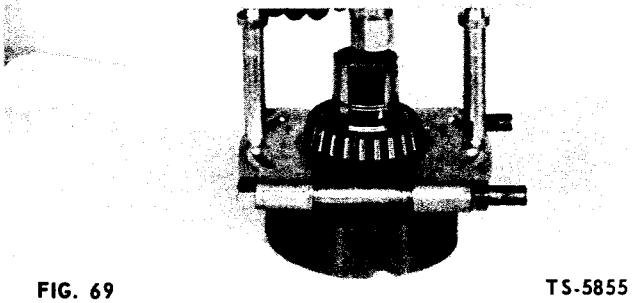


FIG. 69 TS-5855

CLEANING AND INSPECTION

CLEANING

Thoroughly clean all parts, except brake shoe and lining assemblies, 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

Thoroughly clean interior and exterior of housings, bearing caps, etc. 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. Case 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 lapping compound.

Brake Shoes and Lining Assemblies

Do not use solvents or cleaning fluids on brake shoe and lining assemblies. Thoroughly clean brake shoes 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 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 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, 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.

Housings and Covers

Inspect housings, covers, 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 brake linings for wear. If service brake linings are worn to thickness of less than 5/32 inch, linings must be replaced. If parking brake linings are worn to less than 1/8 inch, linings must be replaced. When replacing linings, replace linings on both ends of axle. Inspect service and parking brake 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 in Fig. 70 for service brakes with cast type spider. See Fig. 71 for service brakes with stamped disc backing plate. See Fig. 72 for parking brakes. Set two rivets at each numbered location.

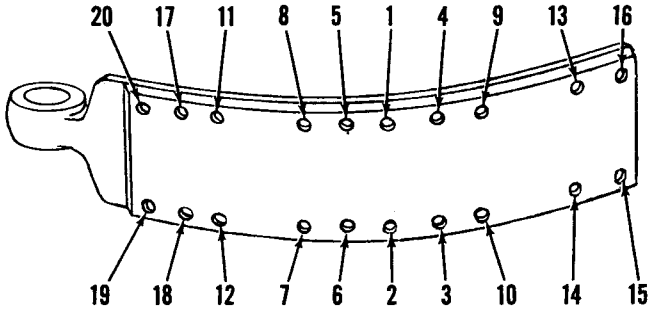


FIG. 70 TS-5856

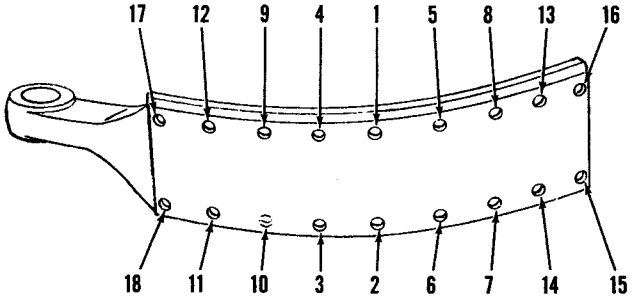


FIG. 71 TS-5857

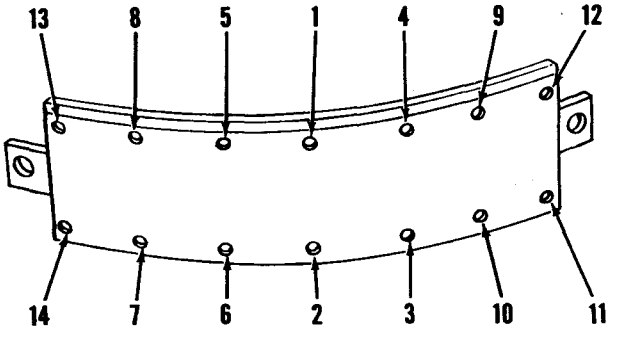
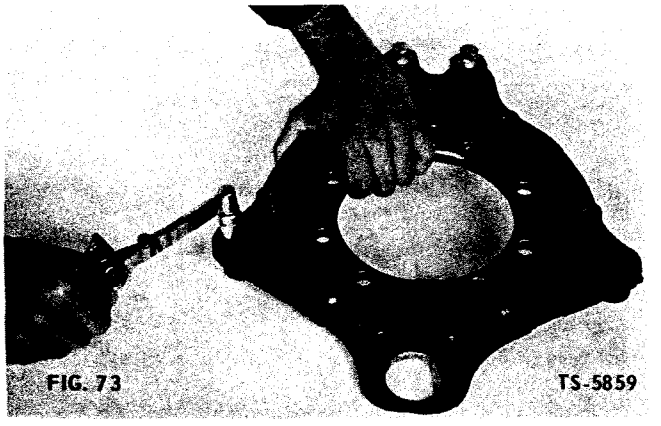


FIG. 72 TS-5858



Replace boots and cups of brake wheel cylinder. If bore of cylinder is scored or worn, replace cylinder.

Check torque required to rotate adjusting cam assembly (Fig. 73). 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.

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. Replace brake drum if internal diameter exceeds that given in Brake Wear Limit Chart.

Check brake shoe anchor pin bushing for wear. Replace anchor pin bushing if inside diameter exceeds that given in Brake Wear Limit Chart.

Brake Wear Limit Chart

Drum Internal Diameter (inches)	Brake Shoe Pin Internal Diameter (inches)
16.37	1.012
17.37	1.261

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 Pinion Shaft

1. Press inner pinion bearing on pinion using steel tubing for driver (Fig. 74). Driver dimensions are given in Fig. 75.

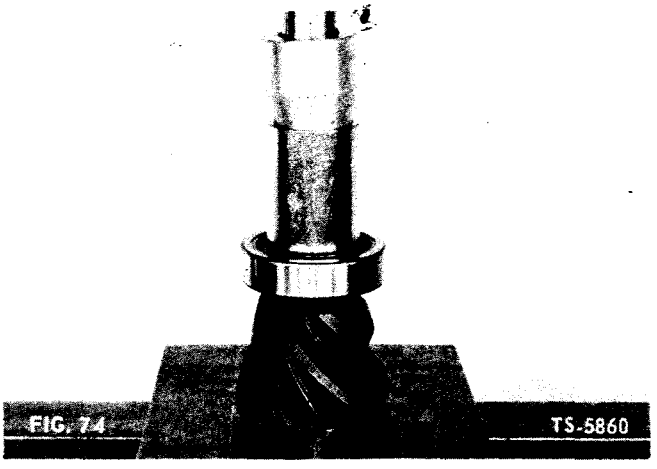


FIG. 74 TS-5860

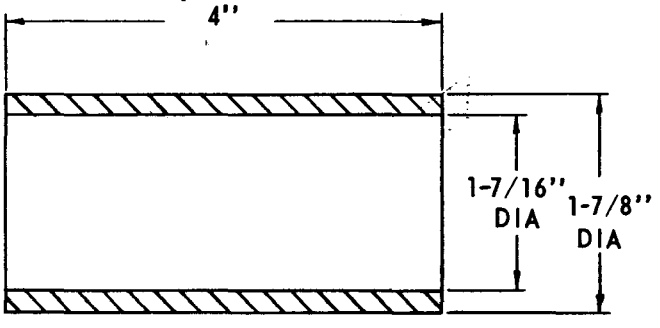


FIG. 75 TS-5861

2. Stake pinion shaft in four places to retain bearing (Fig. 76). Use square end staking tool as shown in Fig. 77.

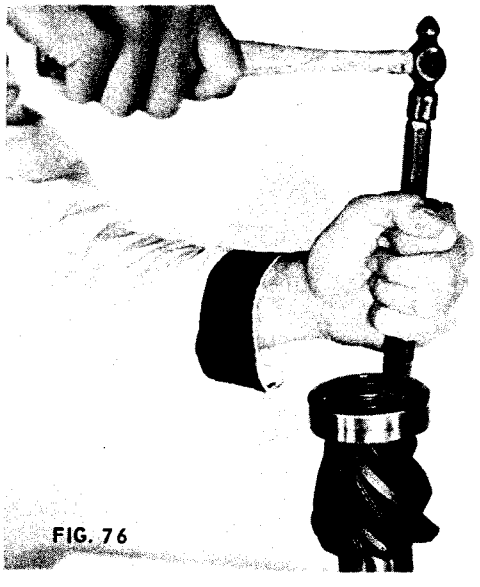


FIG. 76 TS-5862

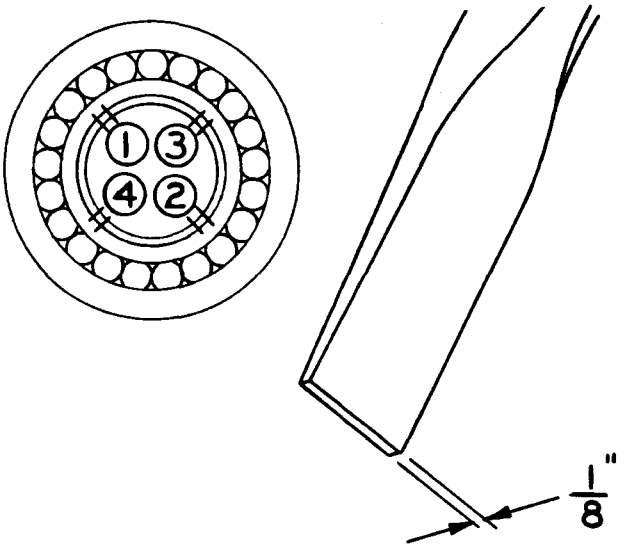


FIG. 77 TS-5402

3. Press center pinion bearing cone onto pinion shaft (Fig. 78).

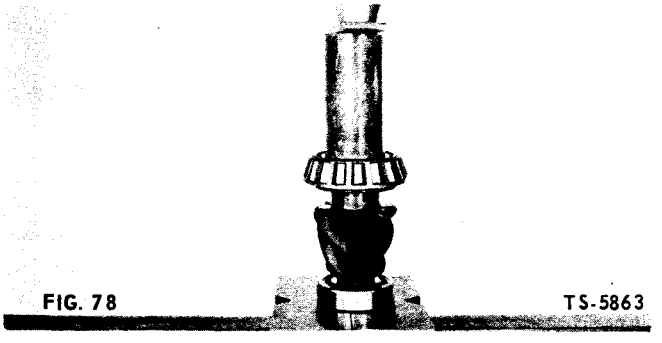


FIG. 78 TS-5863

4. 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. 79).

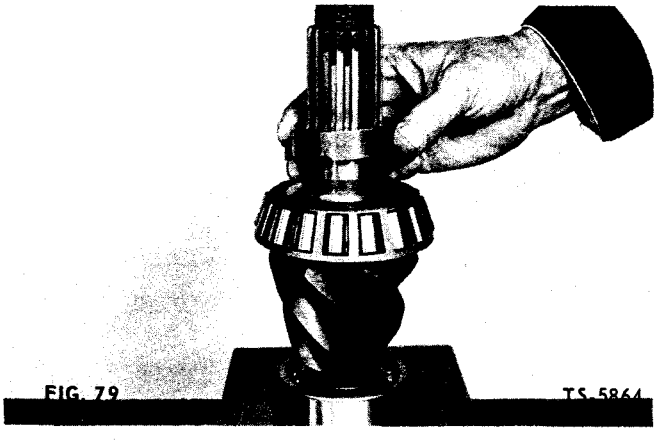


FIG. 79 TS-5864

5. Press both bearing cups into pinion bearing cage (Fig. 80). Bearing driver dimensions are shown in Figs. 81 and 82. If axle has only one bearing cup, press it into bearing cage using driver with dimensions as shown in Fig. 83.

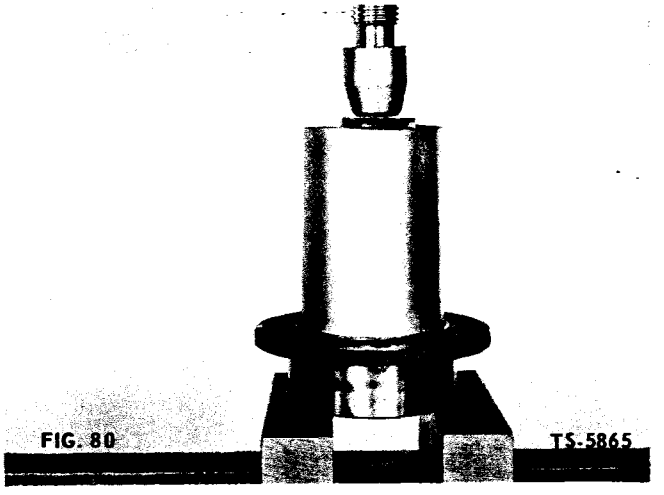


FIG. 80 TS-5865

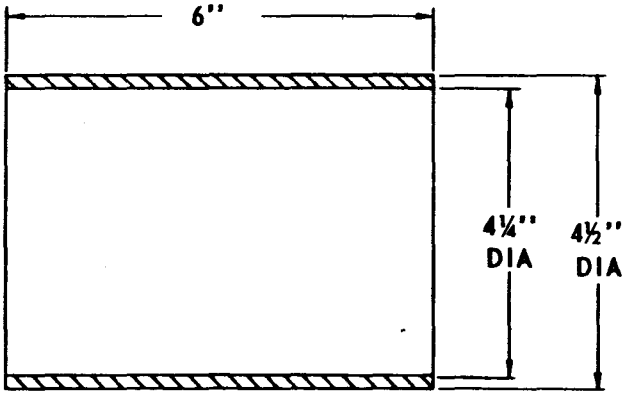


FIG. 81 TS-5866

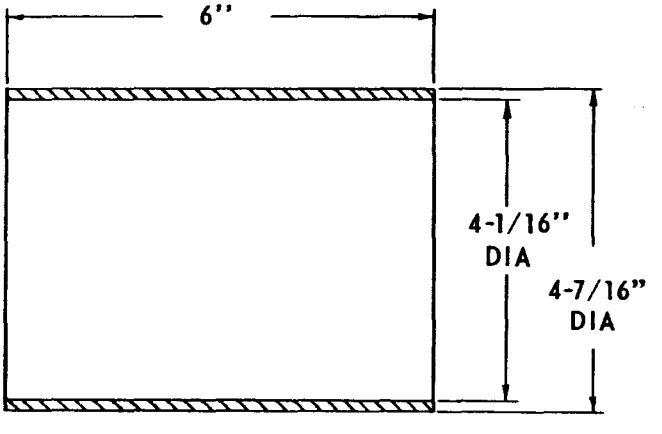


FIG. 82 TS-5867

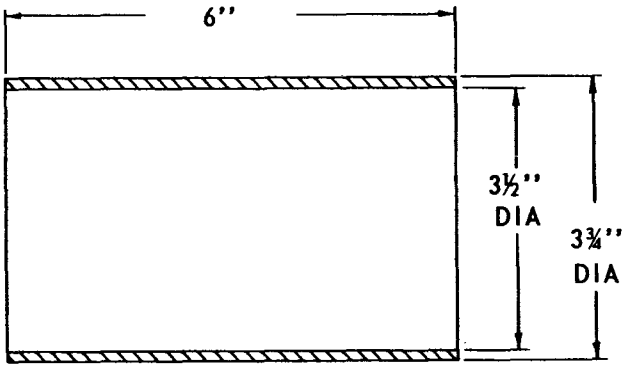


FIG. 83 TS-5868

NOTE: Mounting of differential pinion differs, requiring different reassembly procedures. Refer to steps 6 thru 10 for correct procedure.

6. 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. 84). Driver dimensions are given in Fig. 85.

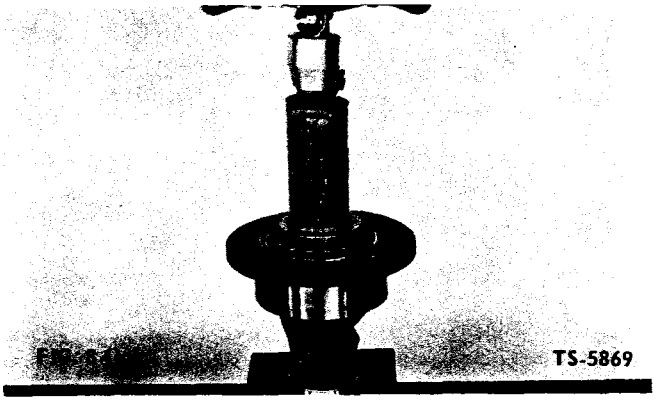


FIG. 84 TS-5869

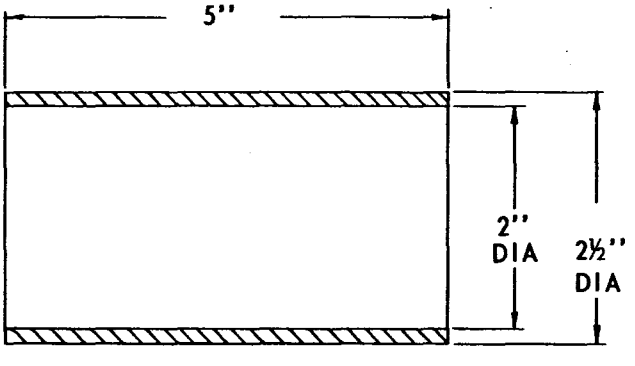
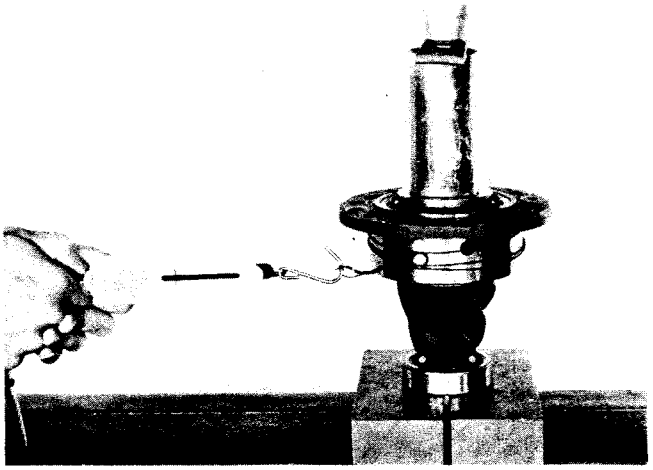


FIG. 85 TS-5870

7. Keep pinion and cage assembly in press with about 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. 86). 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 assembly in differential carrier housing.



8. After spacer and shim have been installed (Fig. 79), position center bearing cup and bearing cage on pinion shaft (Fig. 87).

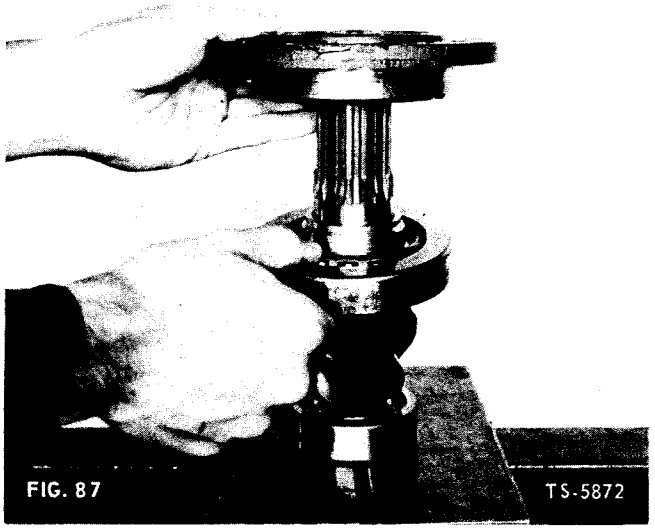


FIG. 87 TS-5872

9. Press outer pinion bearing cone on pinion shaft (Fig. 88) using steel tubing for bearing driver. Driver dimensions are shown in Fig. 85.

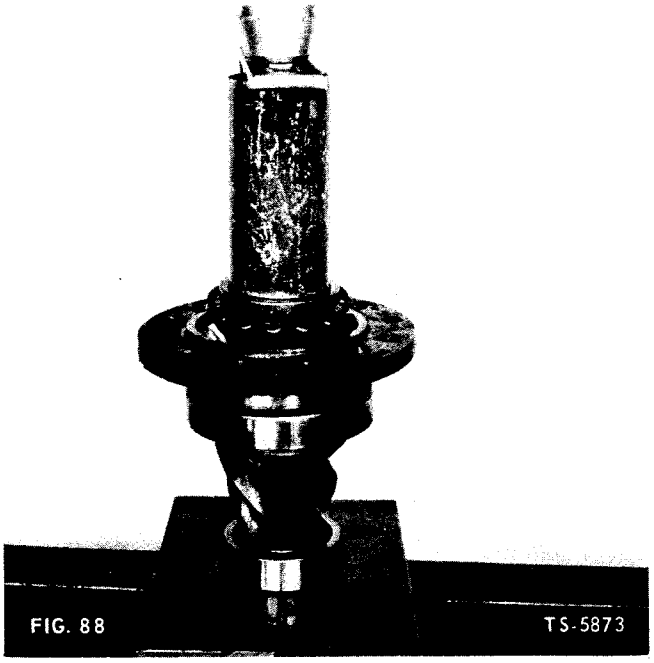


FIG. 88 TS-5873

10. Keep pinion and cage assembly in press with about 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. 89). 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 assembly in differential carrier housing.

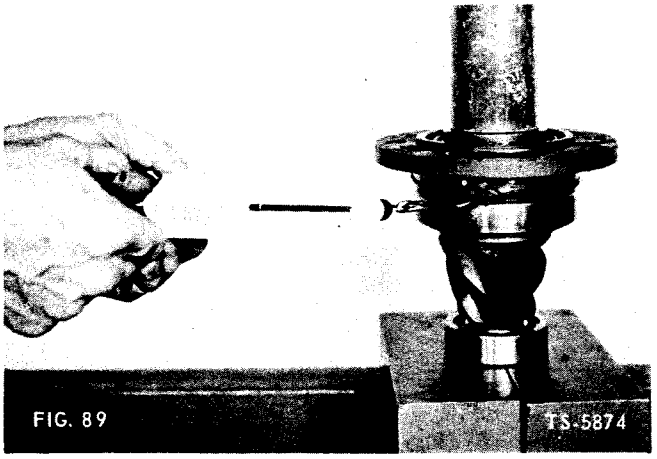


FIG. 89 TS-5874

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. 90). Bearing driver dimensions are given in Fig. 91.

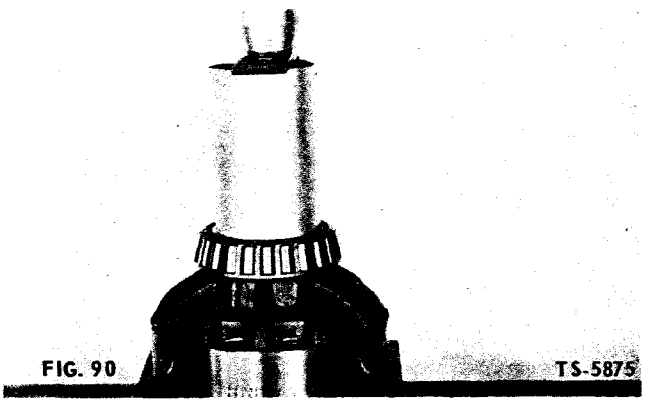


FIG. 90 TS-5875

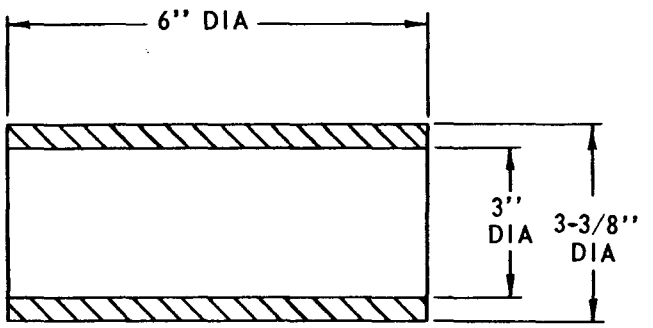


FIG. 91 TS-5876

2. Check ring gear mounting surface of flanged half of differential case for burrs. Remove burrs with file (Fig. 92).

FIG. 92 TS-5877

3. Align matchmarks; install ring gear. Install bolts so internal diameter of ring gear prevents turning of hex head. Install ring gear bolt nuts and tighten per torque specifications (Fig. 93).

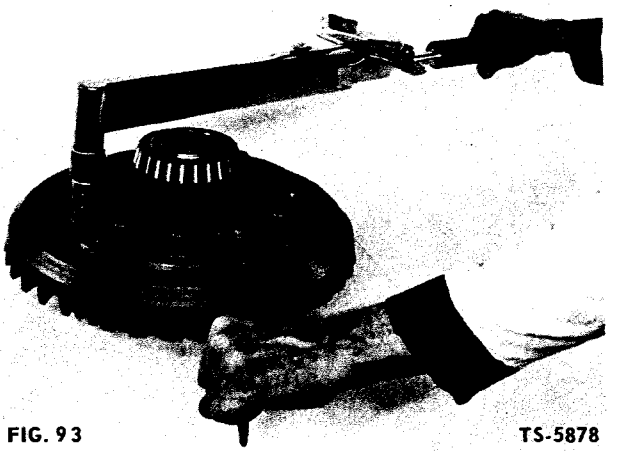


FIG. 93 TS-5878

4. Lubricate and install thrust washer and side gear in differential case and ring gear assembly (Fig. 94). Be sure hole in side gear thrust washer engages dowel projecting from thrust washer bearing surface in differential case half.

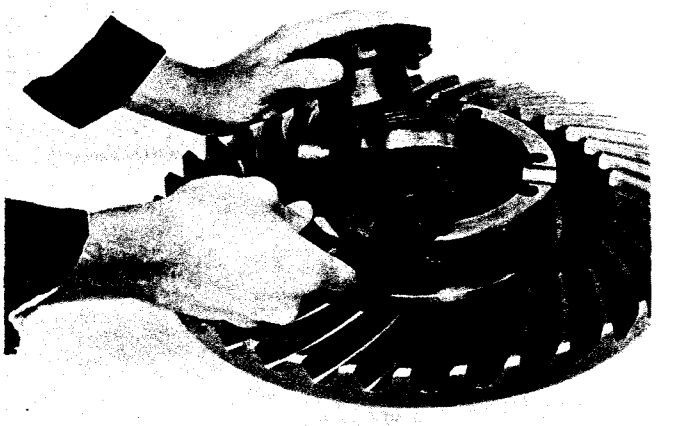


FIG. 94 TS-5879

5. Place pinions and thrust washers on differential spider, lubricate, and set in position on installed side gear. Lubricate and install remaining side gear and thrust washer on pinions (Fig. 95). Be sure hole in side gear thrust washer engages dowel projecting from thrust washer bearing surface in differential case half.

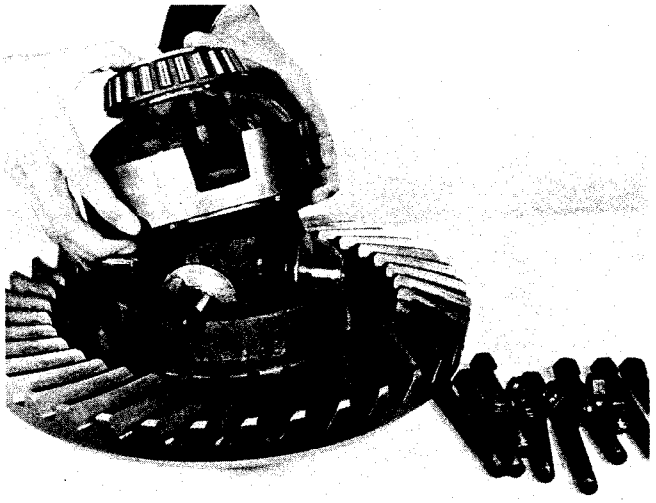


FIG. 95 TS-5852

6. Align matchmarks and install remaining case half on other case half assembly, making sure of full gear engagement (Fig. 96). Install bolts and tighten per torque specifications.

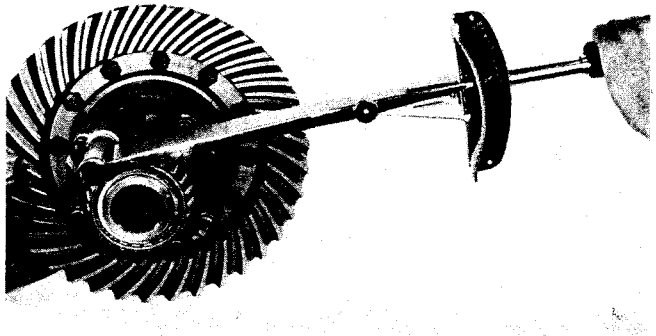


FIG. 96 TS-5880

Reassembly of Differential and Carrier

1. Install bearing cage shims (use original shim pack or equivalent thickness) and pinion shaft assembly in differential carrier assembly. Use four pinion oil seal retainer bolts with flat washers to pull pinion shaft assembly fully into carrier assembly (Fig. 97). Be sure oil passages are aligned.

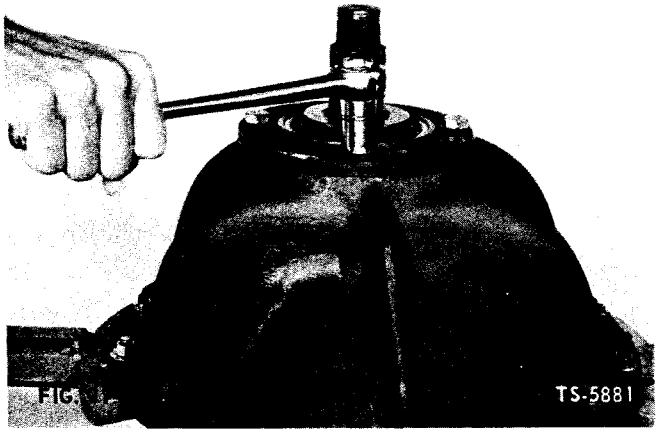
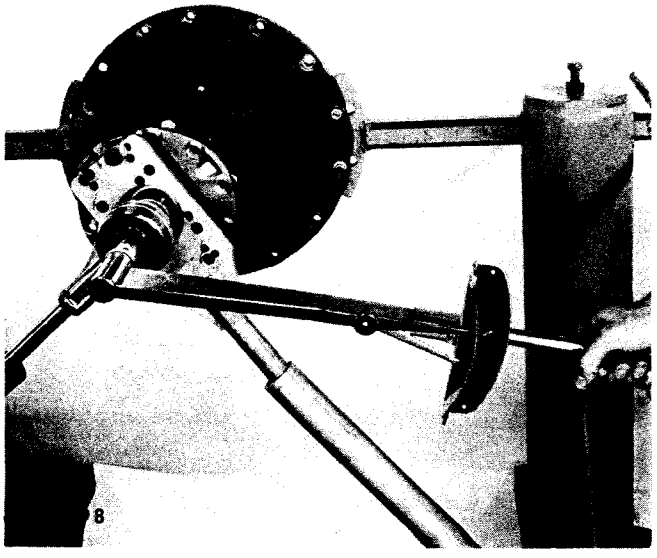


FIG. 97 TS-5881

2. Temporarily install companion flange on end of pinion shaft without installing pinion oil seal retainer. Use companion flange retaining tool on companion flange and tighten companion flange nut (Fig. 98) to specified torque.



3. Use "inch-pound" torque wrench to check bearing preload (Fig. 99). 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 seal retainer bolts and remove companion flange.

FIG. 99

4. Coat outside diameter of seal with Permatex No. 2 and press into pinion oil seal retainer so that lip of seal will face toward pinion. Coat lip with Lubriplate. Install gasket and pinion oil seal retainer. Secure with bolts (Fig. 100), and tighten to torque specifications.

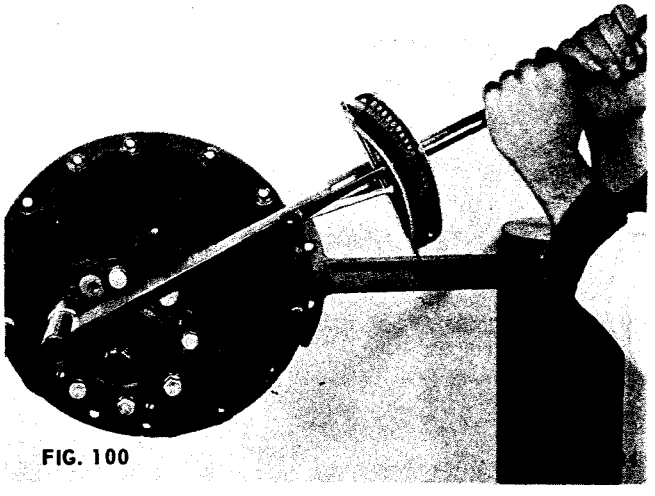


FIG. 100

5. Install companion flange on end of pinion shaft with flat washer and nut. Tighten nut as shown in Fig. 98 to torque specifications and secure nut with cotter pin.

NOTE: If axle is equipped with differential mounted parking brake, do not torque nut and install cotter pin at this time. This will be done later when parking brake is installed. Temporarily install companion flange to facilitate hoisting of differential.

6. 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. 101).

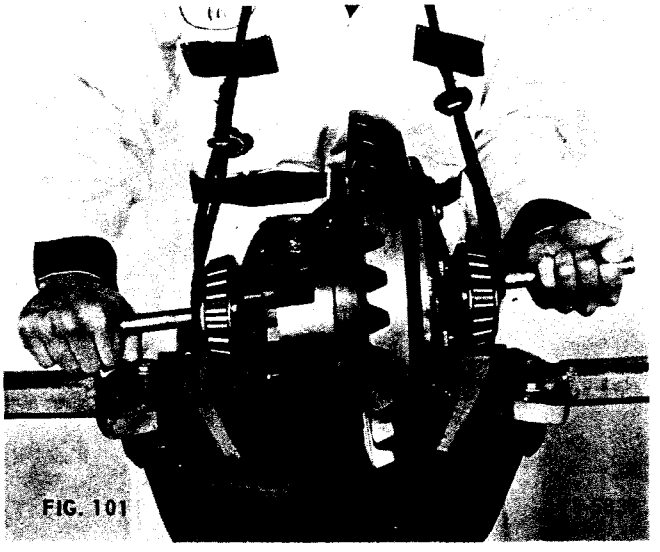


FIG. 101

7. 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. 102). 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.

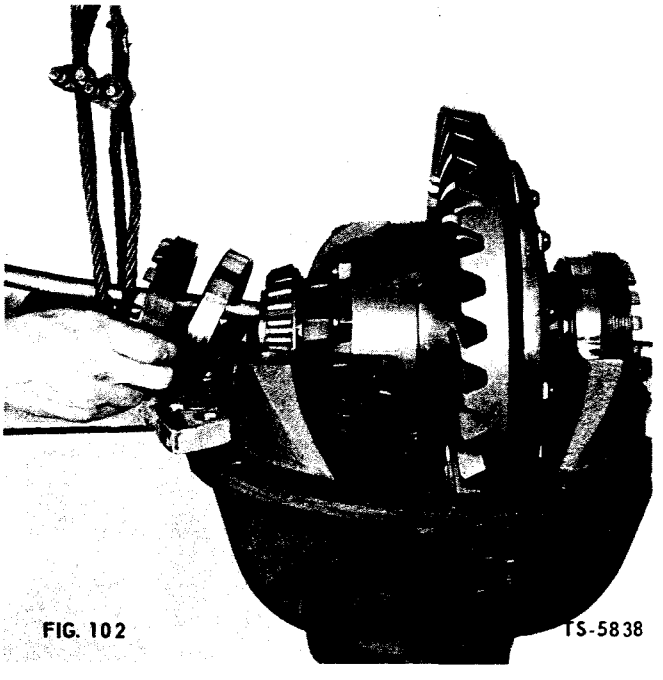


FIG. 102 TS-5838

8. Position bearing caps on bearings and nuts, making sure matchmarks made during disassembly are properly aligned. Install bearing cap bolts (Fig. 103) and tighten until snug, but do not fully torque.

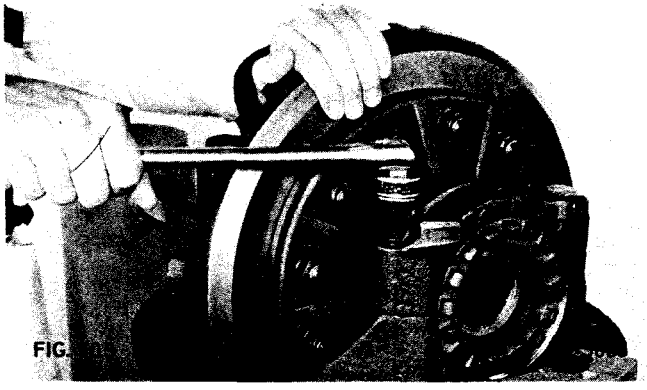


FIG.

9. Tighten bearing adjusting nuts to adjust bearings to zero end play (Fig. 104). This condition may be checked with screwdriver as shown (Fig. 105). 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.

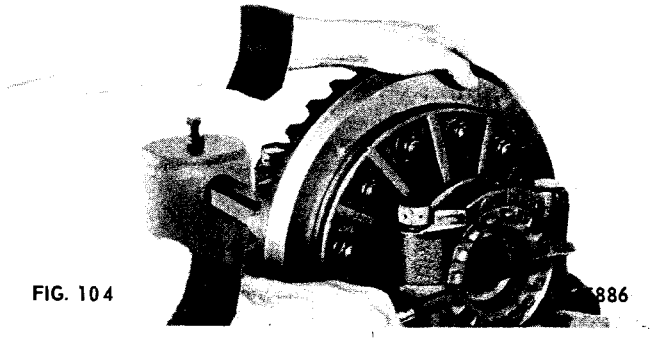
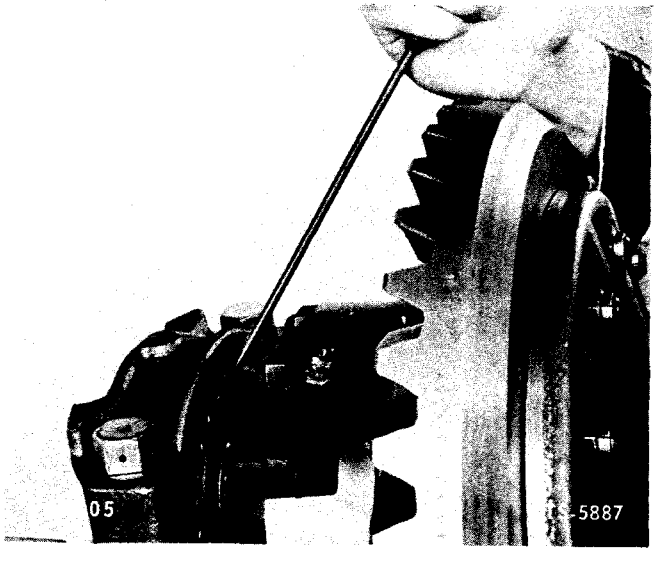


FIG. 104 886



05 5887

10. 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. 106. 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 if new gear set is used, or adjust to backlash noted at disassembly for old gears.

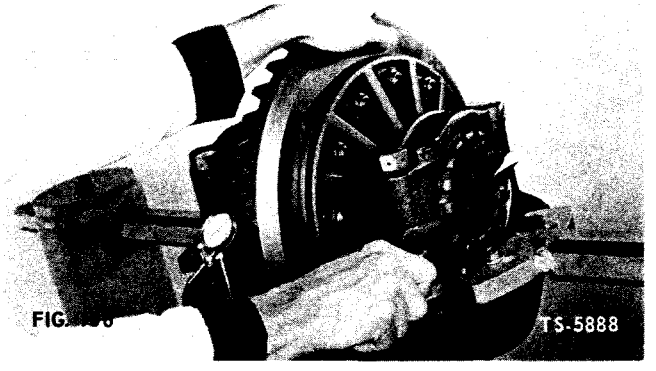
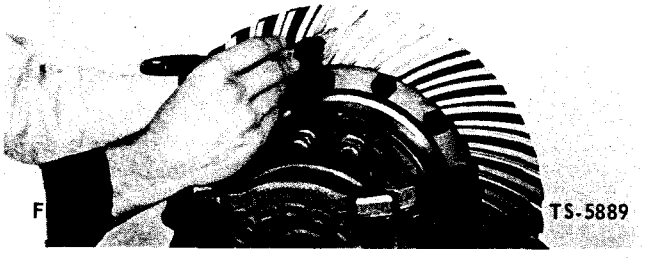


FIG. TS-5888

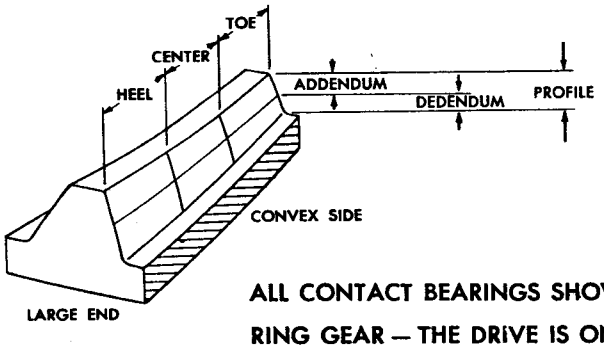
11. Check ring and pinion gear for proper tooth contact. Paint ring gear teeth with a mixture of red lead and linseed oil (Fig. 107). When ring and pinion gears are rotated, the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts. 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.

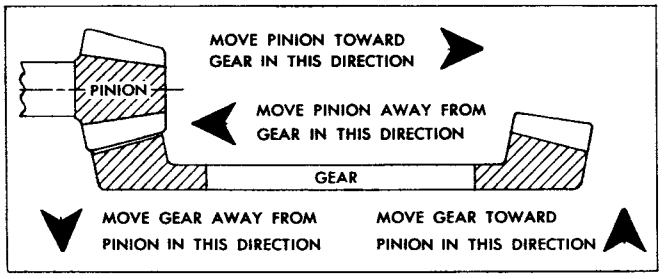


F TS-5889

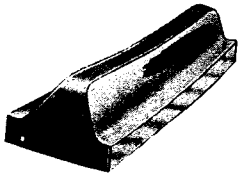
Refer to gear tooth contact chart (Fig. 108). If proper tooth contact pattern is not as shown, readjust backlash or add or remove pinion bearing cage shims as necessary. Split shims are provided

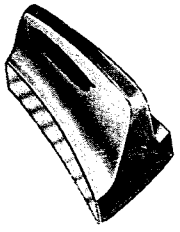
SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART





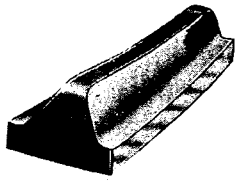
ALL CONTACT BEARINGS SHOWN BELOW ARE ON RIGHT HAND SPIRAL RING GEAR — THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

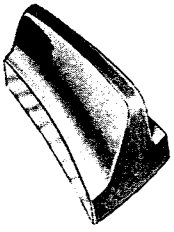




CONDITION 1

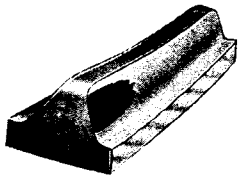
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

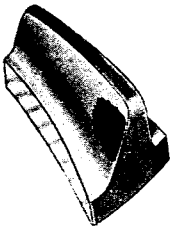




CONDITION 2

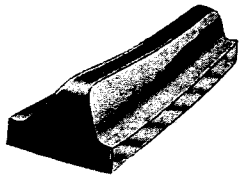
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

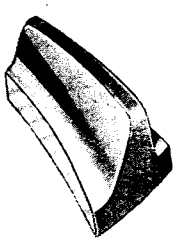




CONDITION 3

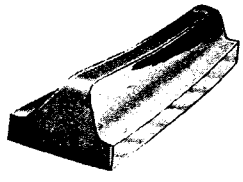
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION.

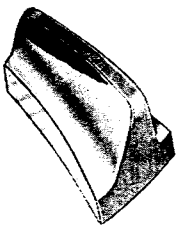




CONDITION 4

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. 108

TS-5574

to permit 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.

12. Tighten bearing cap bolts (Fig. 109) per torque specifications. With dial indicator, recheck ring gear and pinion backlash. Recheck differential bearings for end play as described in step 9.

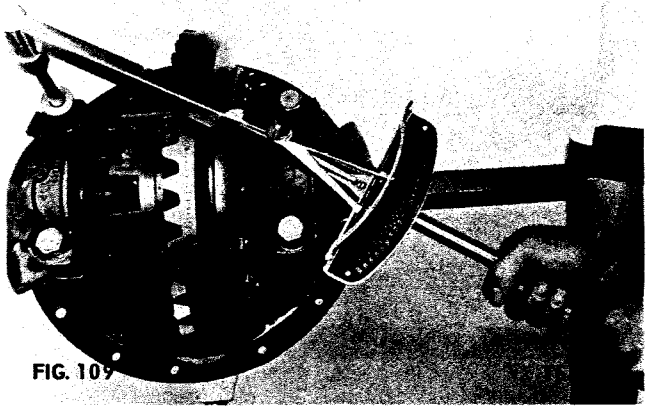


FIG. 109

13. Use dial indicator to check back face of ring gear. Rotate at least one full turn (Fig. 110). 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.


110

14. Install adjusting nut lock with bolt and lockwasher (Fig. 111). Tighten per torque specifications.

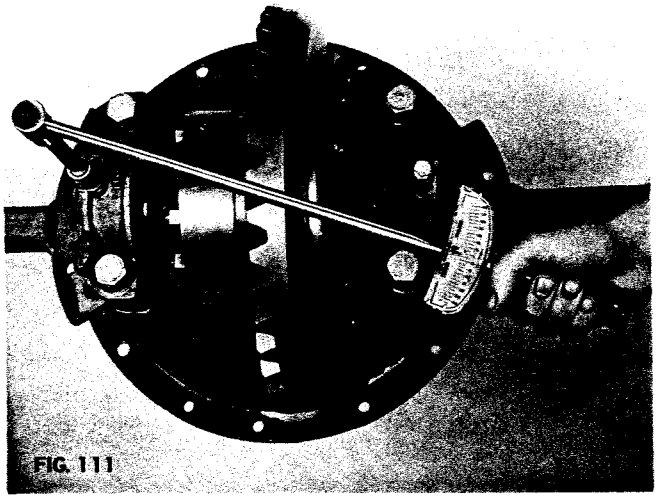
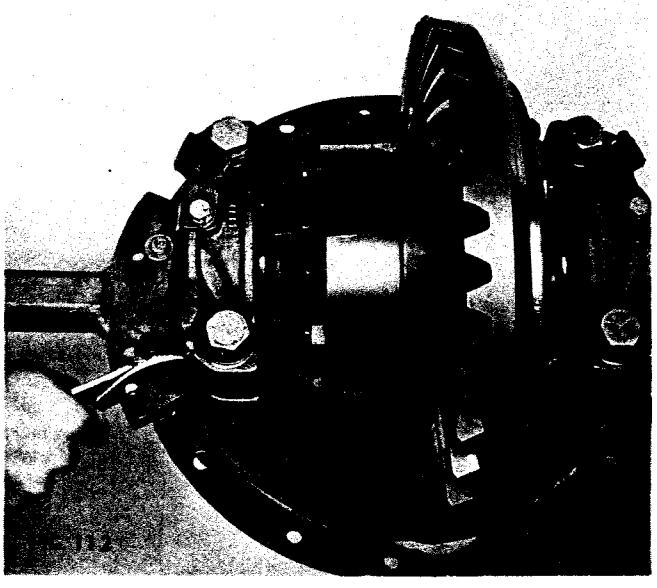


FIG. 111

15. Lockwire together the bearing cap bolts and adjusting nut lock bolt (Fig. 112).


112

16. 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 BRAKE ASSEMBLY

Brakes Using Cast Type Spider

1. Lubricate operating parts and inner bore of brake cylinder with hydraulic brake fluid, and install spring, two cups, and two pistons in cylinder. Install outer boots and push rods (Fig. 113).

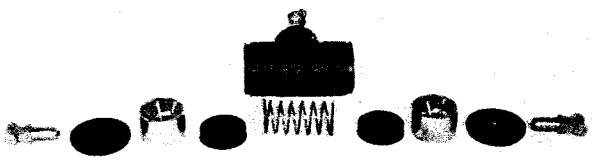


FIG. 113 TS-5827

2. If anchor pins were removed, coat eccentrics with Never-Seez compound, position in brake disc, and install nuts, but do not tighten (Fig. 114).

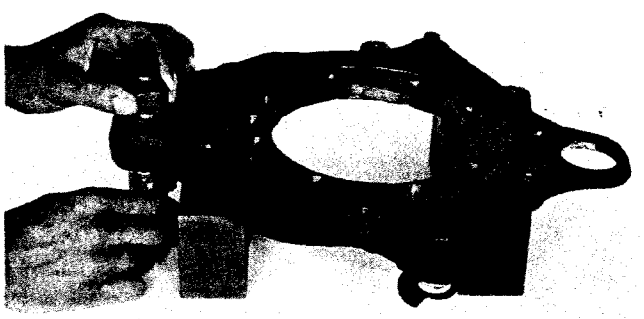
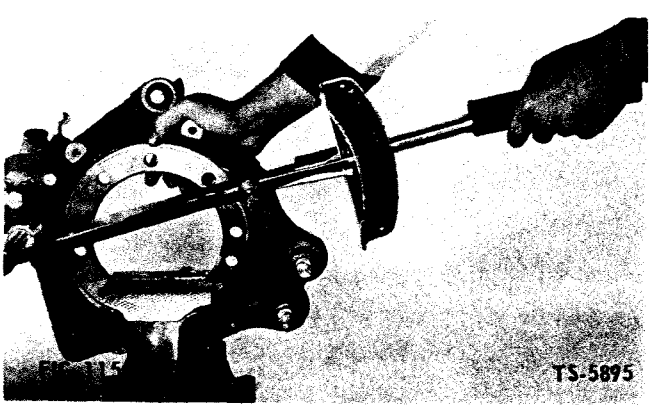


FIG. 114 TS-5894

3. Install cylinder on brake disc with bolts and lockwashers (Fig. 115). Tighten to torque specifications.



TS-5895

4. Position brake shoe on anchor pin and push rods. Install opposite shoe in same manner (Fig. 116).

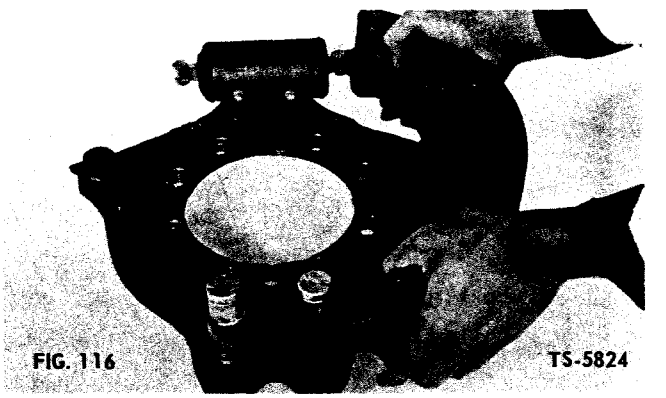


FIG. 116 TS-5824

5. Install anchor pin strut on anchor pins after both shoes are installed; install anchor pin retaining ring (Fig. 117).

TS-5823

6. Install brake shoe return spring with brake spring pliers. Make sure push rods are properly engaged in pistons and in brake shoe slots (Fig. 118).

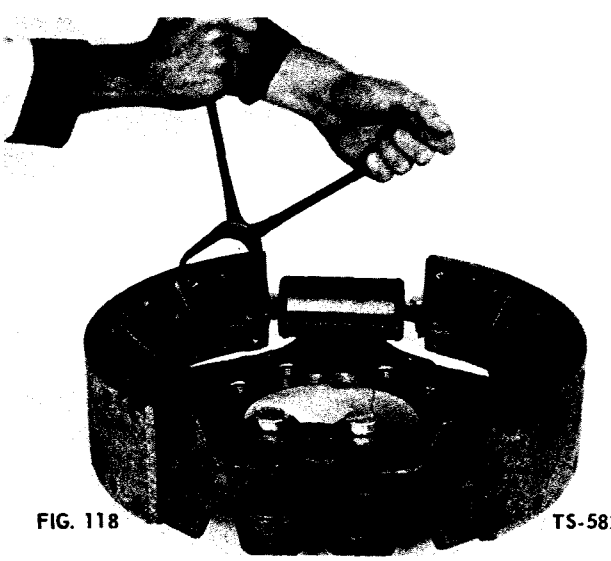


FIG. 118 TS-5822

7. Rotate anchor pins and cams to positions shown in Fig. 119. Tighten anchor pin nuts lightly. Do not torque until brake adjustment is done following complete reassembly of axle.

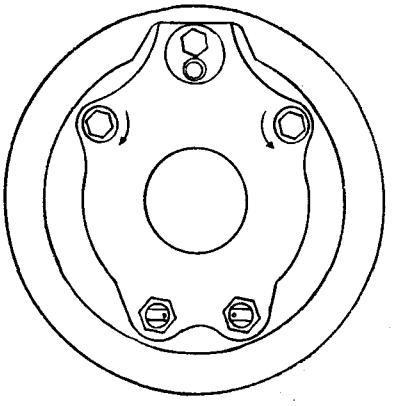


FIG. 119 TS-5896

Brakes Using Stamped Disc as Backing Plate

1. 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. 113).

2. Position brake cylinder on brake disc assembly; secure with two bolts and lockwashers. Tighten bolts to specified torque (Fig. 120).

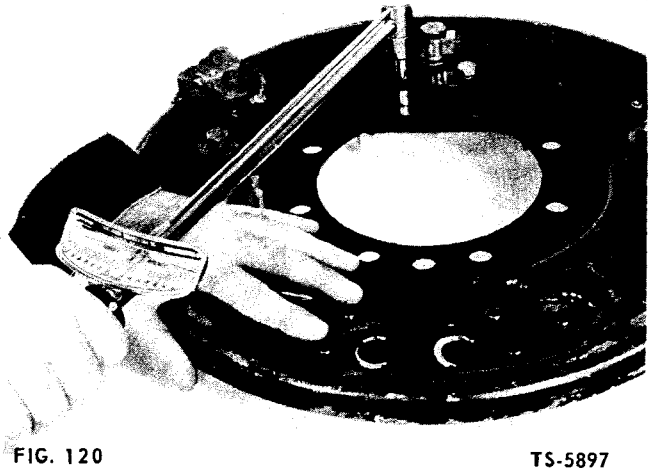


FIG. 120 TS-5897

3. Coat eccentric of anchor pin with Never-Seez compound and position on brake disc. Secure with nut and lockwasher, but do not tighten (Fig. 121).

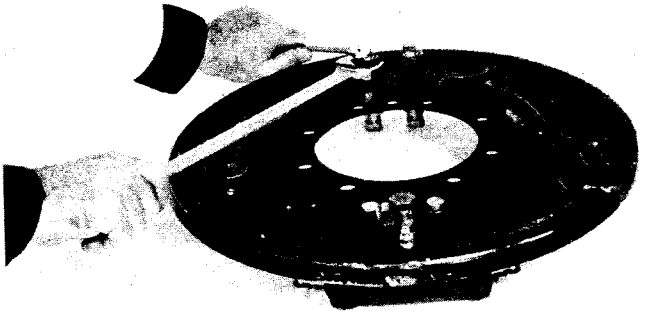


FIG. 121 TS-5833

4. Position one end of brake actuator in one actuator bracket, then slide other end in second bracket (Fig. 122).

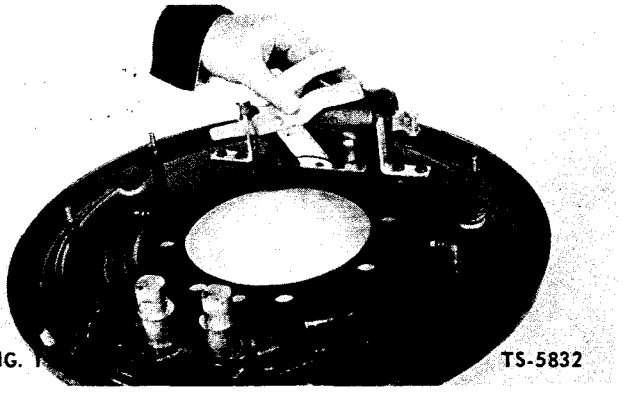


FIG. 122 TS-5832

5. Install washer on guide pin and position brake shoe on disc. Install second washer and "C" ring on guide pin. Clinch "C" ring with pliers. Secure brake shoe to anchor pin with large "C" ring. Clinch "C" ring with pliers (Fig. 123).

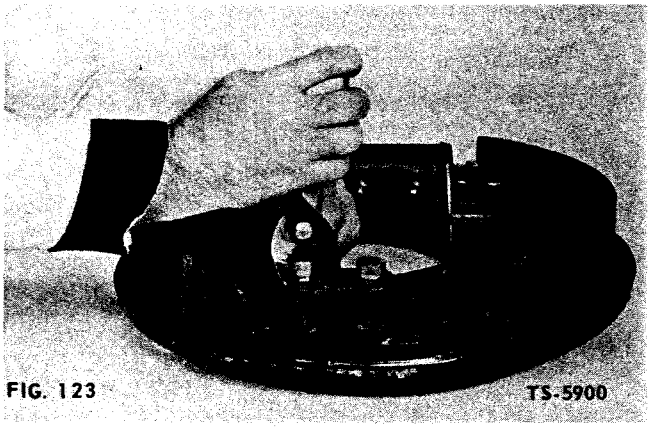


FIG. 123 TS-5900

6. Install brake spring with brake spring pliers (Fig. 124). Make sure wheel cylinder push rods are seated in slot of brake shoe.

FIG. 124 TS-5829

7. Rotate anchor pins and cams to positions shown in Fig. 119. Tighten anchor pin nuts lightly. Do not torque until brake adjustment is done following complete reassembly of axle.

Reassembly of Internal Gear and Hub

1. Check that bearing seat on hub is free of nicks and burrs. Press bearing cone on internal gear and hub using bearing driver (Fig. 125). Bearing driver dimensions are given in Fig. 126.

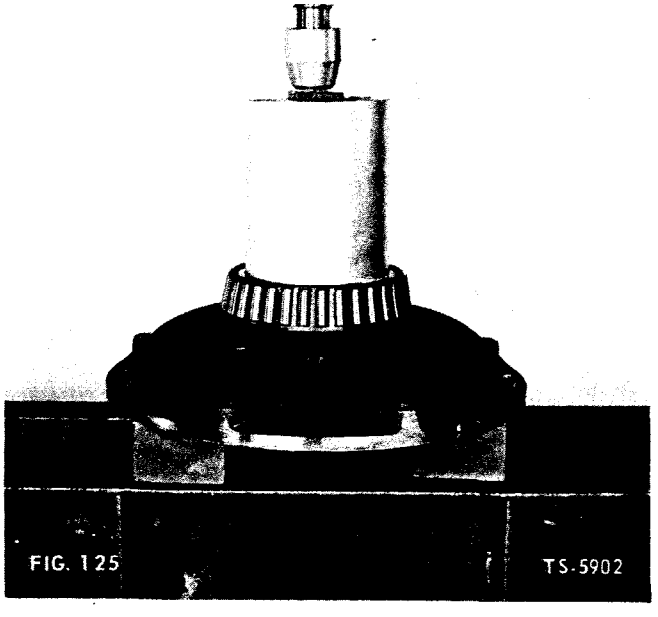


FIG. 125 TS-5902

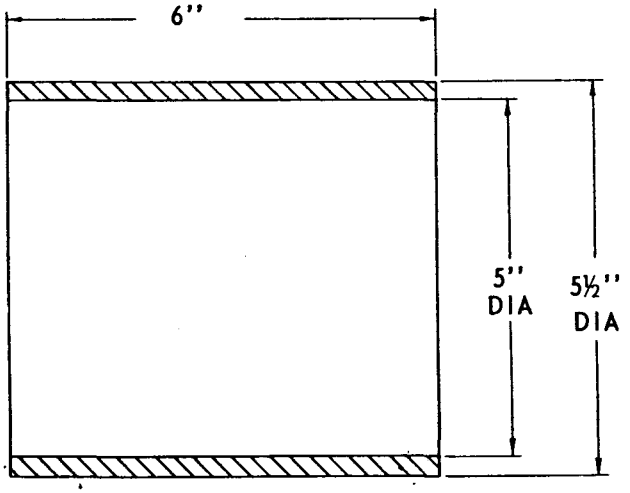


FIG. 126 TS-5903

2. Position internal gear on hub. Secure with bolts (Fig. 127). Tighten per torque specifications.

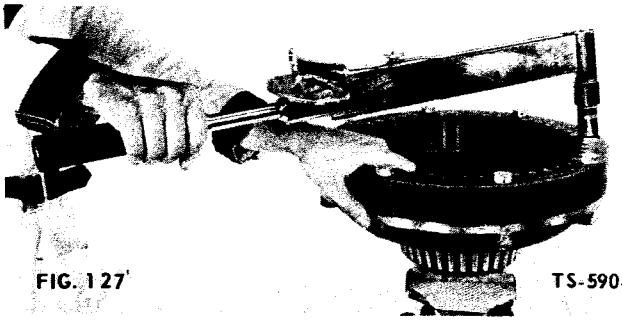


FIG. 127 TS-5904

Reassembly of Hub and Drum

1. 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. If available, use bearing driver to press cups into place (Fig. 128). Bearing driver dimensions are given in Fig. 129. If bearing driver is not available, use soft drift and mallet to drive cups into place. Make sure cups are fully seated.

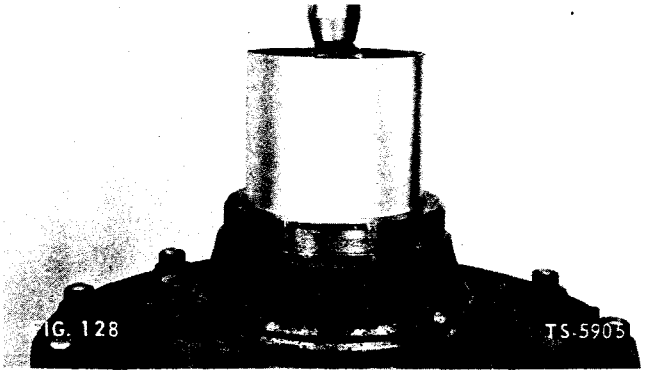


FIG. 128 TS-5905

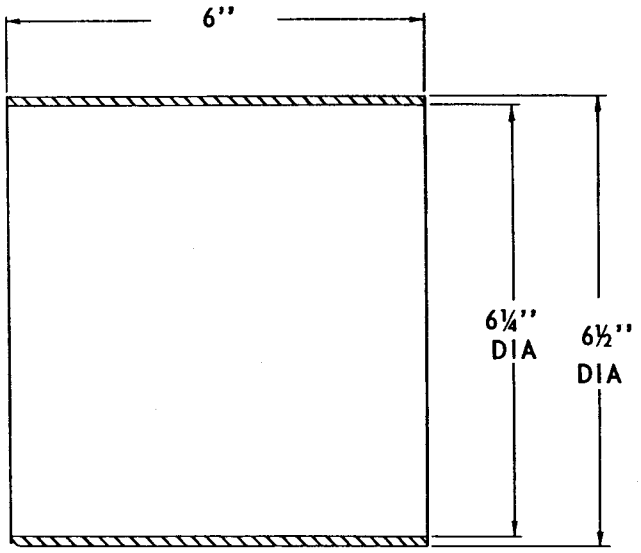
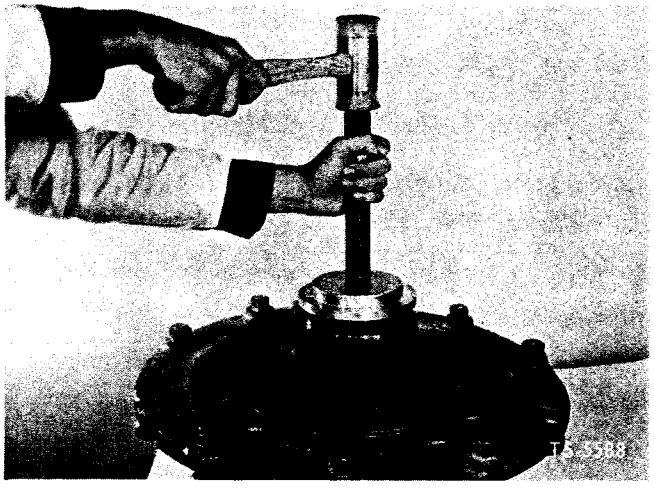


FIG. 129 TS-5906

2. Lubricate inner wheel hub bearing cone with gear oil and position wheel hub on bearing cup. Coat outside diameter of oil seal with Permatex No. 2. Lubricate lip of seal with Lubriplate. Press or drive oil seal into hub using seal driver (Fig. 130). The seal driver dimensions are given in Fig. 131. Spring-loaded lip of seal must face inward. Wipe off excessive Permatex after seating seal.



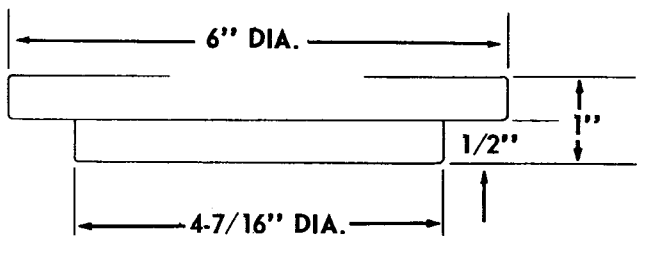


FIG. 131 TS-5907

3. Position oil catcher and brake drum on hub. Install bolts and flat washers (Fig. 132). Tighten per torque specifications. Lockwire bolts in pairs.

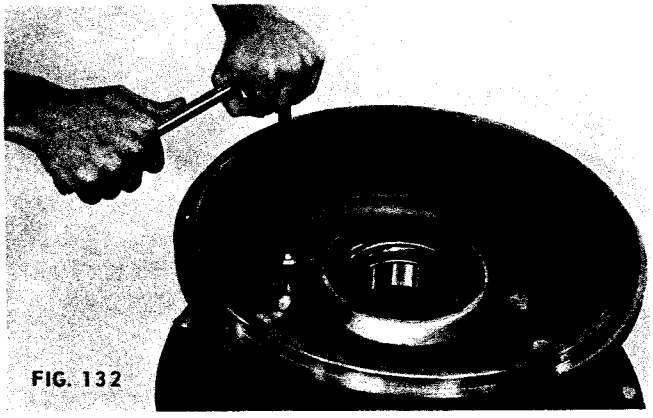


FIG. 132

Reassembly of Planet Spider Assembly

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 one full row of rollers, roller spacer, and another full row of rollers in each pinion (Fig. 133).

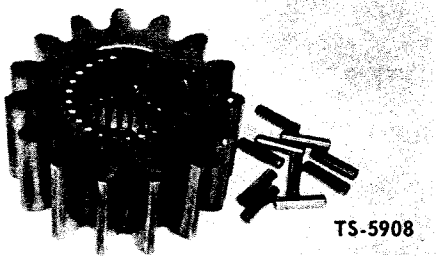


FIG. 133 TS-5908

2. Position assembled planet pinion and two pinion thrust washers in planet spider assembly, making sure tangs on thrust washers engage the grooves in the spider (Fig. 134).

FIG. 134 TS-5813

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. 135). Press end of pinion shaft flush with face of spider assembly.

FIG. 135 TS-5909

4. Stake pinion shaft ball groove in two places to lock ball (Fig. 136).

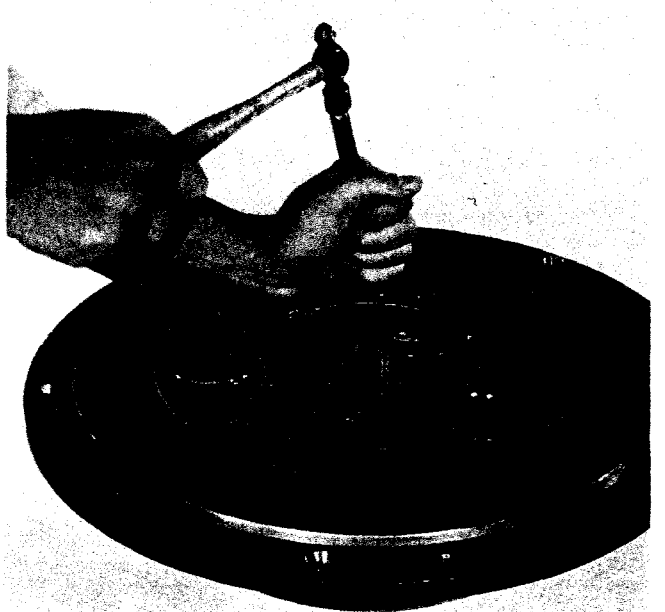


FIG. 136 TS-5910

Reassembly of Axle Parts

1. Apply a light coating of Permatex No. 2 to face of axle housing and align tapered holes of differential carrier flange with studs in housing (Fig. 137).

FIG. 137 TS-5911

2. Install dowels, nuts, and washers on three studs. Install remaining bolts and washers (Fig. 138). Tighten per torque specifications.

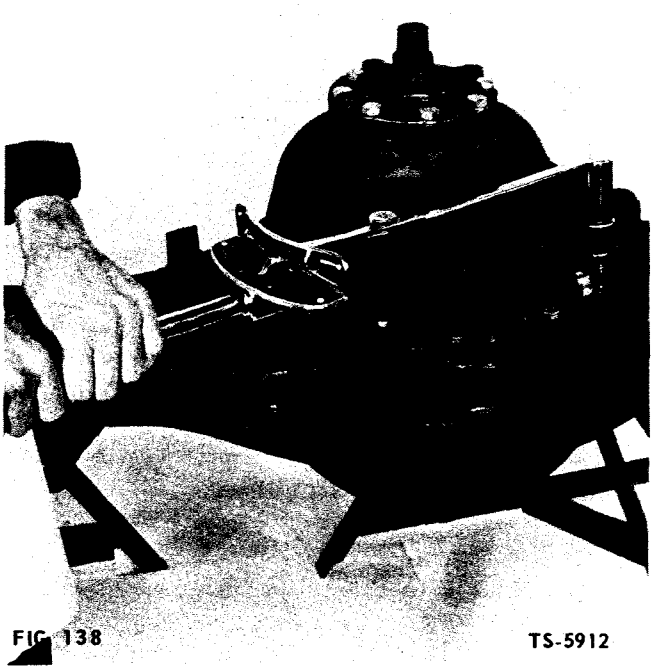


FIG. 138 TS-5912

3. On axles equipped with parking brakes, remove companion flange that was temporarily installed during differential reassembly. Position parking brake backing plate on pinion oil seal retainer of differential; secure with bolts and lockwashers (Fig. 139). Tighten to torque specifications.

NOTE: Parking brake backing plate positions vary for different axles. Refer to Fig. 140 for the various backing plate positions. Note that Fig. 140 shows backing plate in inverted position to coincide with reassembly photographs.

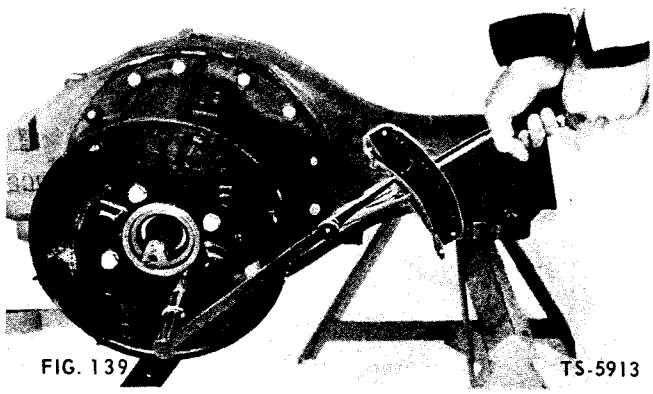


FIG. 139 TS-5913

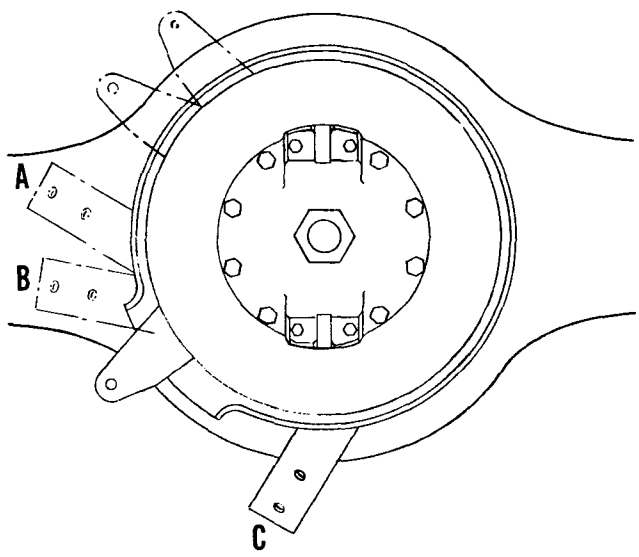
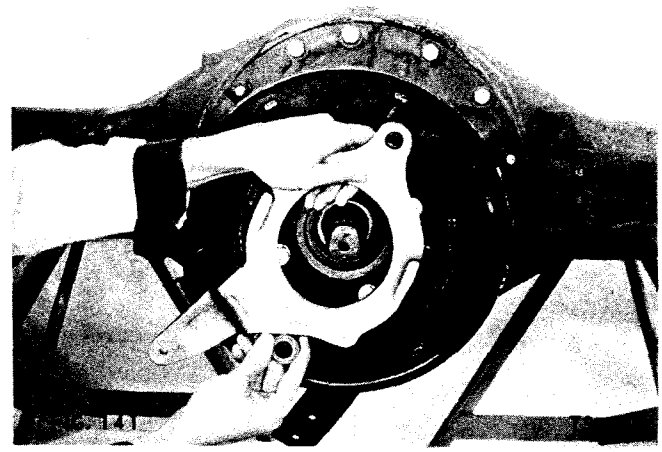


FIG. 140 TS-5914

4. Position brake actuating roller on pawl and position operating cam lever on backing plate (Fig. 141).



5. Position brake shoe assemblies on backing plate (Fig. 142).

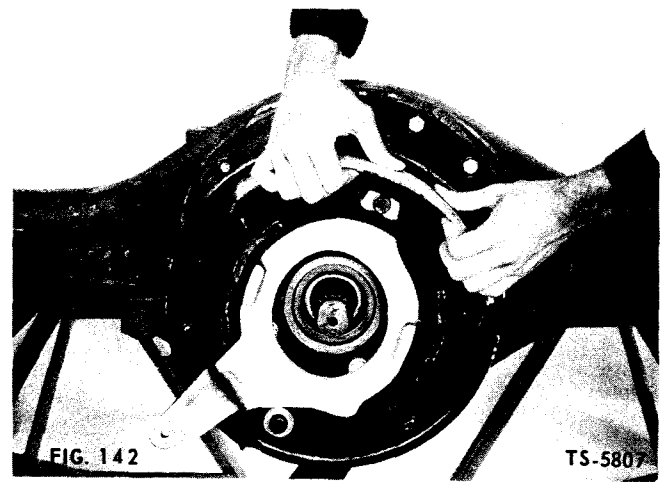


FIG. 142 TS-5807

6. Install brake shoe return springs with brake spring pliers (Fig. 143).

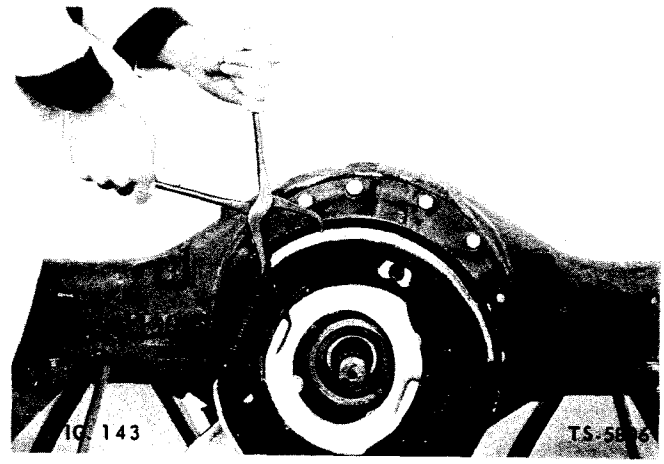


FIG. 143 TS-5806

7. Position parking brake drum on companion flange. Secure with bolts, lockwashers, and nuts. Tighten per torque specifications (Fig. 144).

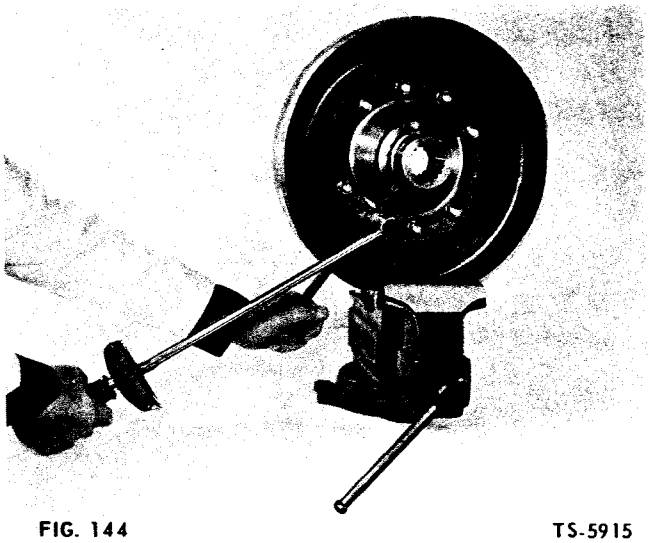


FIG. 144 TS-5915

8. Position assembled parking brake drum and companion flange on pinion shaft of differential. Secure with flat washer and nut (Fig. 145). Tighten to torque specifications. Install cotter pin to retain nut to shaft.

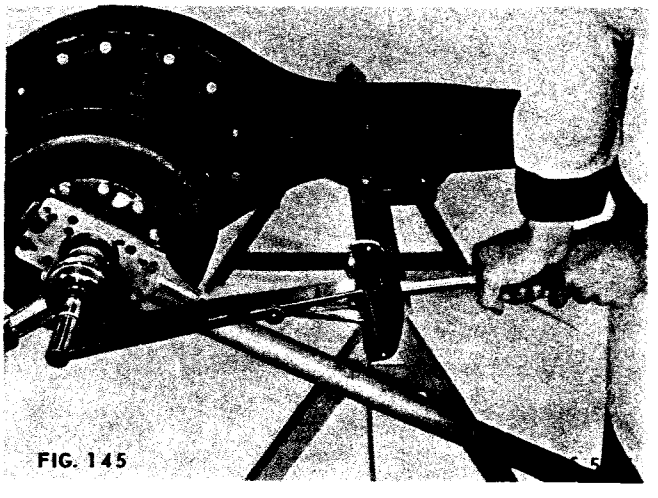
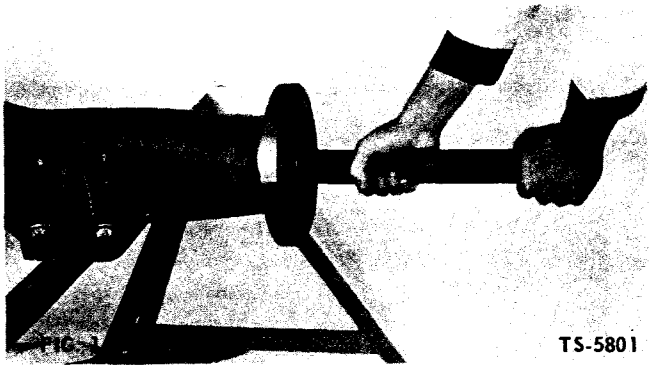


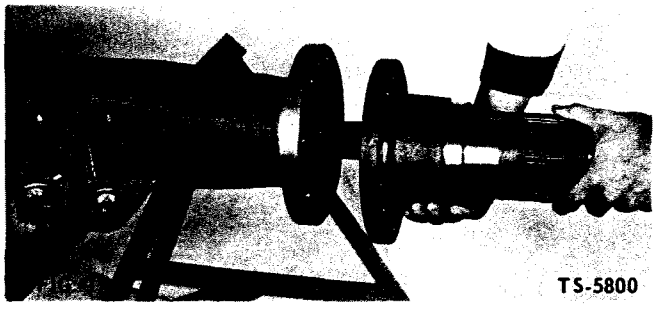
FIG. 145

9. Slide axle shaft into position in axle so that splines engage differential (Fig. 146). Make sure end of axle shaft with retaining ring groove is toward outside of axle.



TS-5801

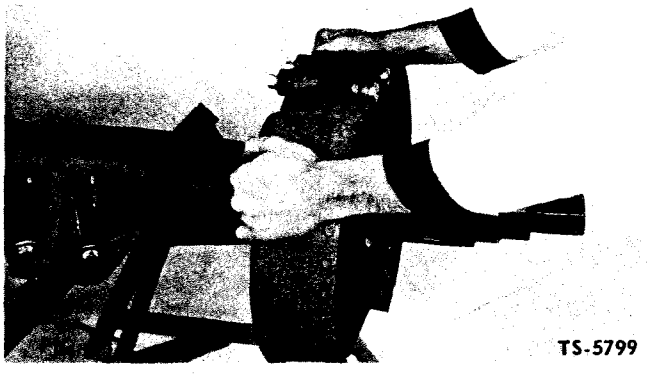
10. Position spindle on axle housing so that mounting holes in spindle are aligned with mounting holes in axle housing (Fig. 147).



TS-5800

11. Position brake assembly on spindle so that wheel brake cylinder will be at top when axle is in normally installed position (Fig. 148).

NOTE: Figure 148 shows axle inverted from normal position so that axle housing mounting pads are resting on horses. This assures rigid mounting during overhaul.



TS-5799

12. Secure brake assembly and spindle (if separate) to axle housing with bolts, nuts, and flat washers (Fig. 149). Tighten per torque specifications.

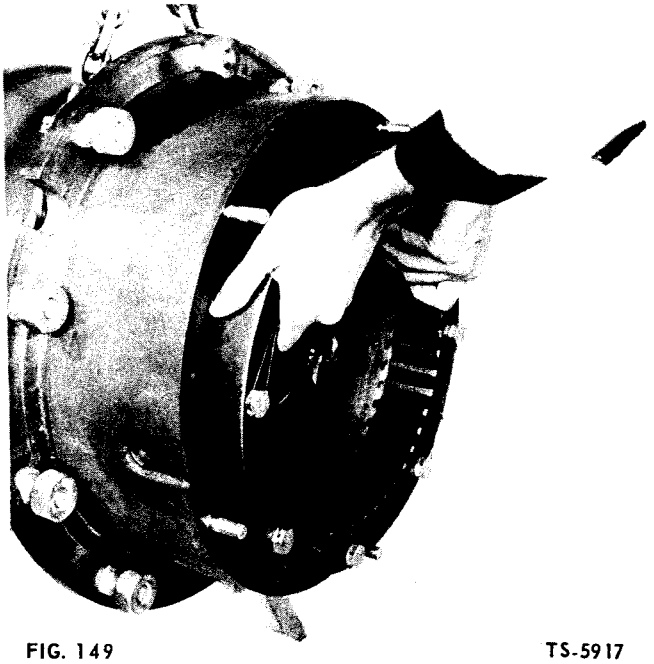
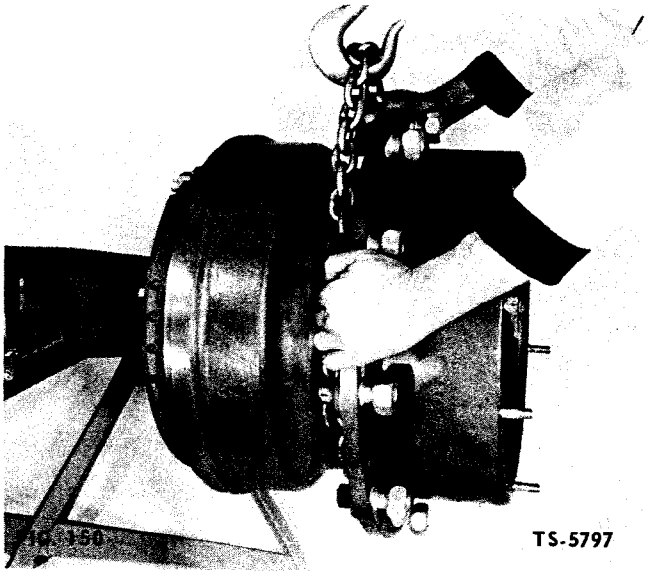


FIG. 149 TS-5917

13. Lubricate lip of hub and drum oil seal with Lubriplate. Position hub and drum on axle (Fig. 150). 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. If difficulty is encountered when trying to position brake drum over the brake shoes, check for improper adjustment of brake shoes. During installation, shoe adjusting cams should be adjusted to minimize brake spring tension.



TS-5797

14. Continue to support hub and drum with hoist. Position internal gear and hub on axle so that it engages splines on spindle (Fig. 151).

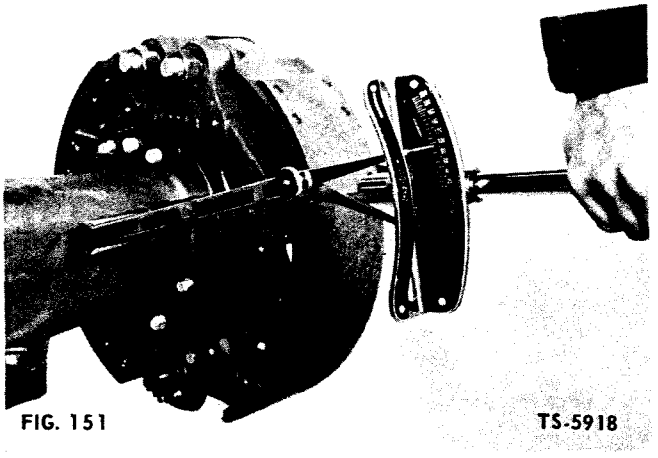
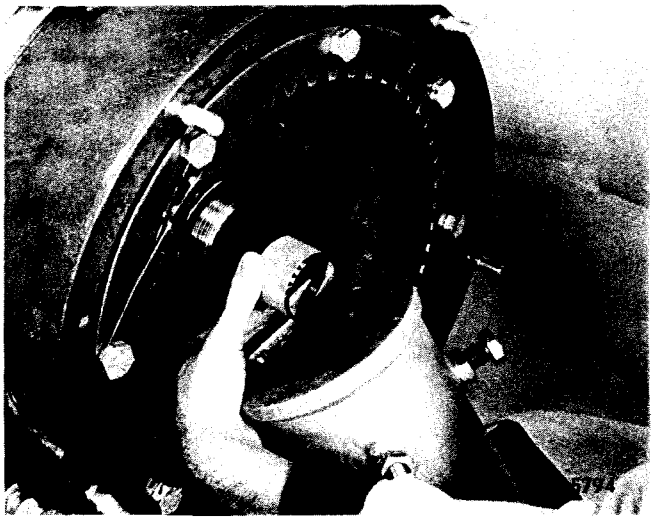


FIG. 151 TS-5918

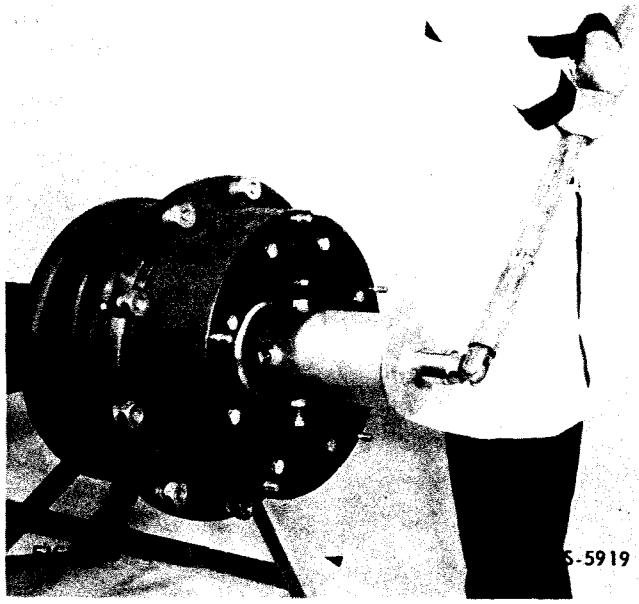
15. Install inner nut on spindle. Wrap several turns of .010 inch to .020 inch shim stock around splines of axle shaft to protect splines. Install spindle nut socket wrench (Clark Part No. 945940) on nut (Fig. 152) and tighten guide bolts lightly against axle shaft.

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.

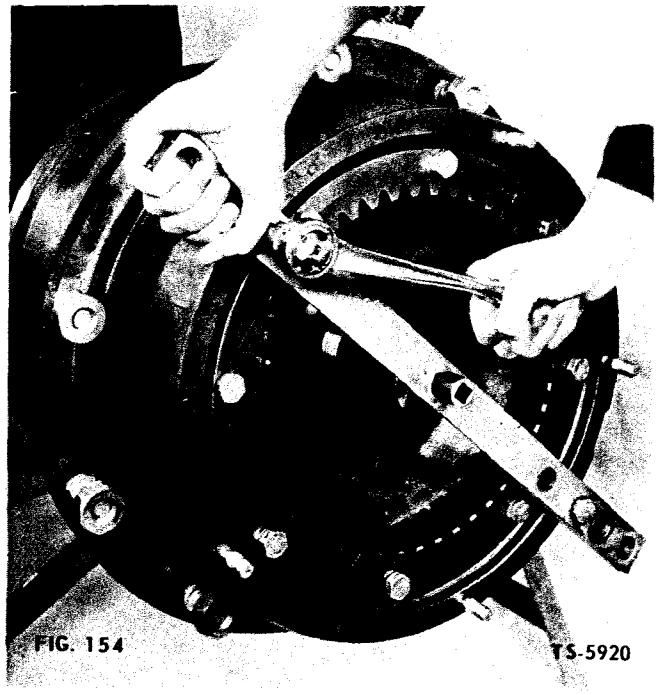


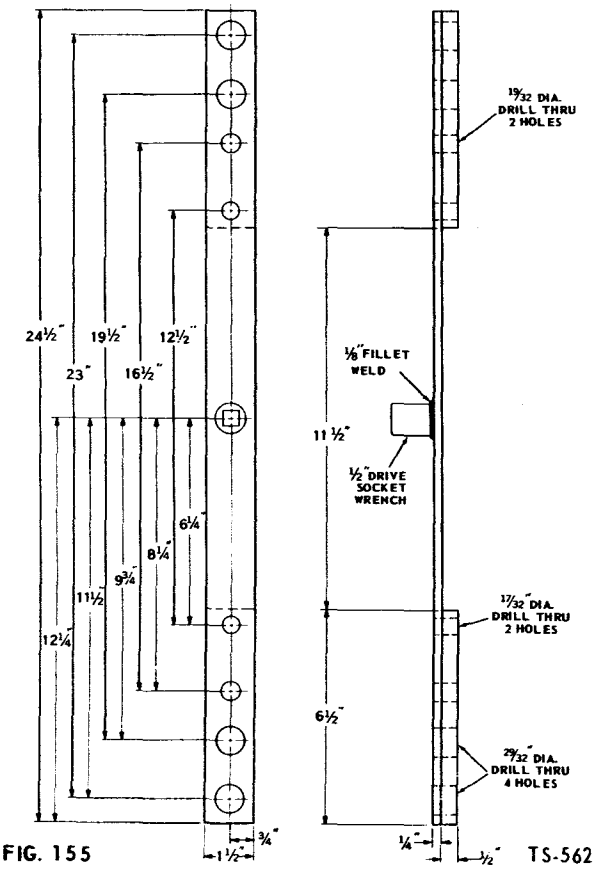
First (Preferred) Method:

16. Tighten inner spindle nut while rotating wheel hub in both directions until there is slight binding (Fig. 153).



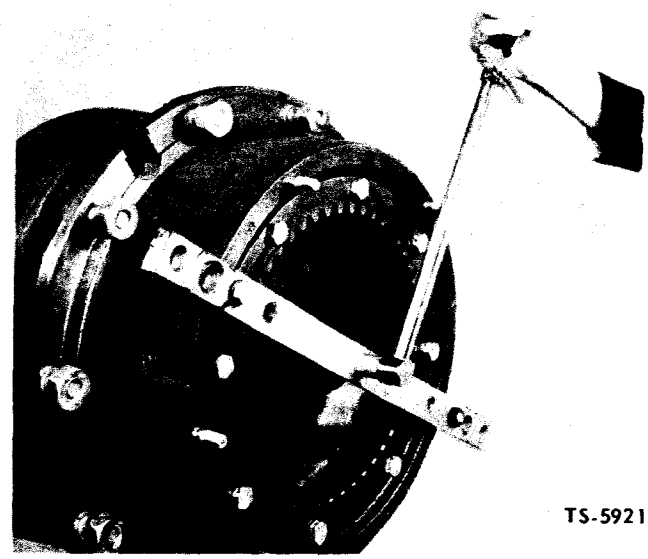
17. Install torque wrench adapter bar, as shown in Fig. 154, using a stud and one 1/2-13 x 1-1/2 inch bolt. The adapter bar can be fabricated locally to specifications outlined in Fig. 155. Bar illustrated will accommodate wheel hubs with planetary bolt circle diameters of 12-1/2, 16-1/2, 19-1/2, and 23 inches.





18. Install torque wrench, 0 to 50 ft. lb. scale, if available, and check rotating torque or rolling resistance of wheel hub (Fig. 156). Rotating torque when using new bearings should be between 7 and 12 ft. lbs. On used bearings rotating torque should be between 3 and 5 ft. lbs.

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



19. 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 18.

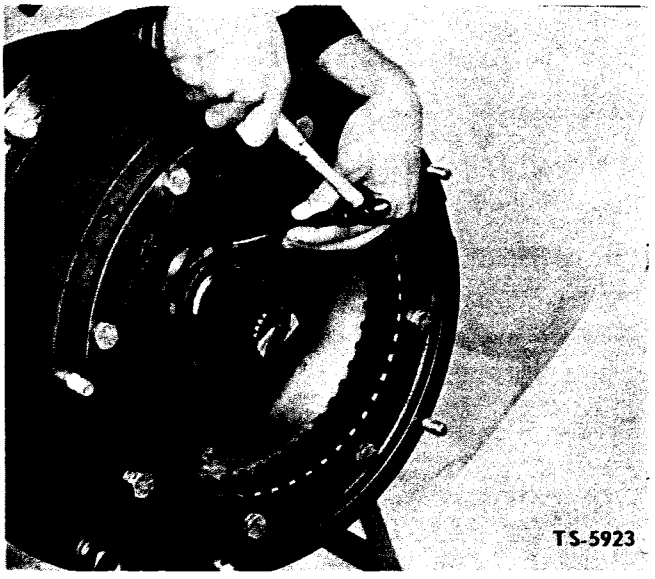
Second (Optional) Method:

20. 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. 157. Tighten inner nut until rotating torque measured on pull scale is within specifications given in note below.

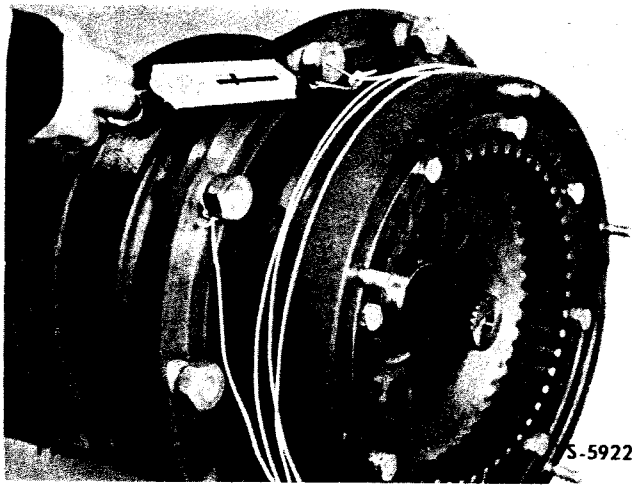
NOTE: Bearing preload rotating torque using a pound pull scale is figured by multiplying the radius (distance from center of wheel to outside diameter of wheel hub) by the reading on the pull scale and dividing by 12 to arrive at ft. lbs. of torque.

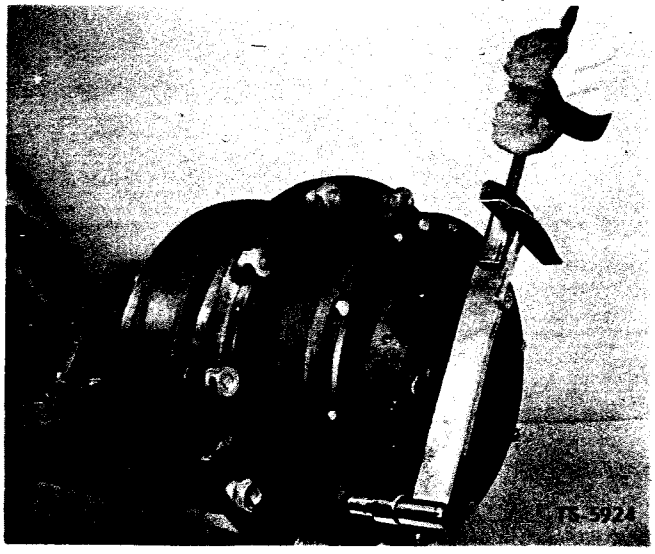
21. Install nut lock and outer nut and tighten securely to lock inner nut in position. Use spindle nut socket wrench as shown in Fig. 152 to tighten nut. Recheck rotating torque by one of two methods outlined above

22. Bend two tangs of nut lock against flats on inner nut and bend two tangs against flats of outer nut (Fig. 158).

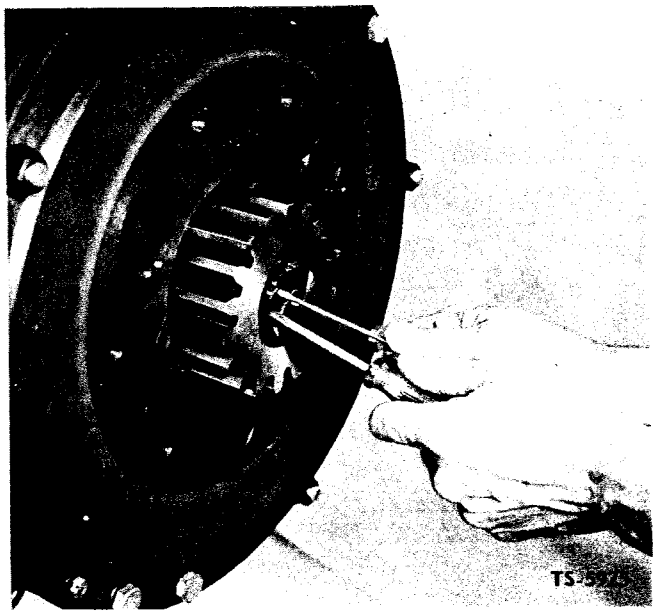

TS-5923

23. Apply a light coating of Permatex No. 2 to mounting flange of the planet spider assembly. Install planet spider on hub with bolts, nuts, dowels and lockwashers (Fig. 159). Tighten to torque specifications.


TS-5922


TS-5924

24. Slide axle out of differential and housing approximately 4 inches and position sun gear on axle shaft. Secure with sun gear retaining ring (Fig. 160). Reinstall axle shaft in differential and housing.



25. Apply light coating of Permatex No. 2 to mounting face of the sun gear thrust cap. Install cap on planetary spider assembly. Make certain that "O" ring seal, if used, is properly positioned in groove in the mounting face, and is not twisted. Tighten bolts to specified torque (Fig. 161).

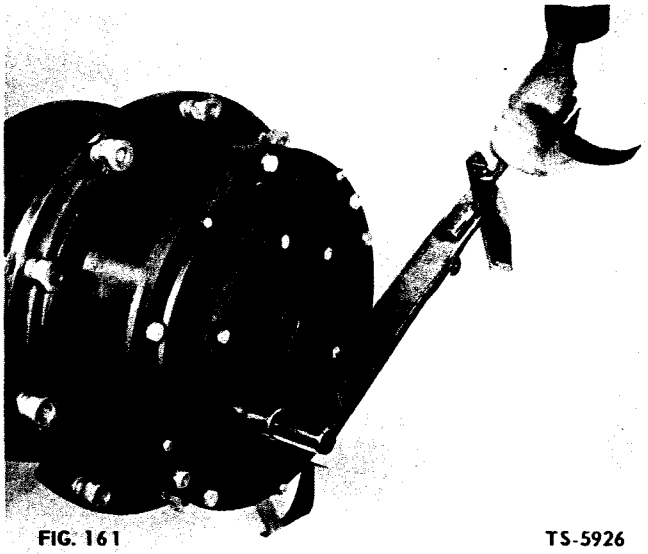


FIG. 161 TS-5926

BRAKE ADJUSTMENT

After assembly of axle, adjust brakes as follows:

1. Rotate brake cams in direction indicated (Fig. 162) until brake lining drags on drum.

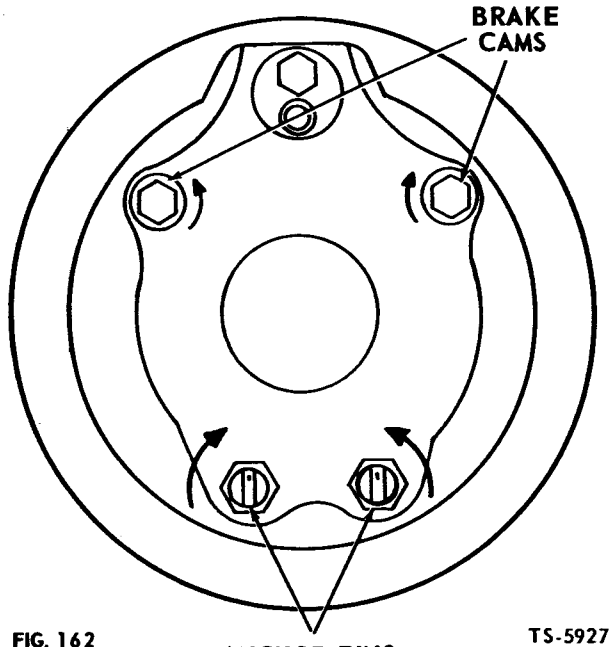


FIG. 162 TS-5927

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 to torque specifications, making sure anchor pin does not rotate while tightening.
7. After installation in the machine, make operational check of brakes to assure proper application and release.

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