

# **CLARK**

## **SHOP MANUAL**

**No. 1988**  
**FD-17000, FD-19000, and FD-24000**  
**SERIES DRIVE AXLE**

### **SPECIFICATION**

<b>130064</b>	<b>131078</b>
<b>130068</b>	<b>131079</b>
<b>130069</b>	<b>131597</b>
<b>131076</b>	<b>131599</b>

# Warranty

Clark Equipment Company (CLARK) has warranted to the Distributor (Seller) who, pursuant to agreement with CLARK, hereby, on its own behalf, warrants to the Buyer each new CLARK product to be free from defects in material and workmanship under normal use and maintenance as herein provided.

Distributor's sole obligation under this warranty shall be limited to repairing, replacing or allowing credit for, at Distributor's option, any part which under normal and proper use and maintenance proves defective in material or workmanship within six (6) months after delivery to or one thousand (1,000) hours of use by Buyer, whichever shall occur first; provided, however, that (i) the product is placed in use not later than one year after shipment from CLARK'S plant; (ii) that notice of any such defect and satisfactory proof thereof is promptly given by Buyer to Distributor; and (iii) such material shall have been returned to Distributor, with transportation charges prepaid and found by Distributor to have been defective.

This warranty does not apply in respect of damage to or defects in any product caused by overloading or other misuse, neglect or accident, nor does this warranty apply to any product which has been repaired or altered in any way which, in the sole judgment of Distributor, affects the performance, stability or general purpose for which it was manufactured.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT OF TITLE), EXPRESSED OR IMPLIED, AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL DISTRIBUTOR BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

This warranty does not apply to parts or trade accessories not manufactured by CLARK, or attachments not manufactured or sold by CLARK. Buyer shall rely solely on the existing warranties, if any, of the respective manufacturers thereof.

## IMPROVEMENTS

It is CLARK'S policy to constantly strive to improve its products. The right therefore is reserved to make changes in design and improvements whenever it is believed the efficiency of the product will be improved thereby, but without incurring any obligation to incorporate such improvements in any product which has been shipped or is in service.

## FD-17000, FD-19000, and FD-24000 SERIES FRONT DRIVE AXLES

## DESCRIPTION

The axle assembly is a full floating spiral bevel type with further reduction provided by planetary gear set within the wheel hub.

## PRIMARY REDUCTION

The spiral bevel pinion and ring gear transmit power through the center differential pinions and side gears to the axle shaft. The spiral bevel differential assembly is mounted on tapered roller bearings which are adjusted by positioning of the two threaded adjusting nuts mounted in the differential carrier and cap assembly. The tapered roller pinion bearing preload is adjusted and maintained by a hardened and precision ground spacer positioned between inner and outer bearings. Spacer is selected at assembly.

## SECONDARY REDUCTION

In the wheel hub, a self-centering sun gear is spline fitted to the axle shaft and drives three planetary pinion gears. These gears in turn mesh with and react against a rigidly mounted internal ring gear. The planet gears rotate on needle roller bearings mounted on hardened and ground pins located in the planet carrier which in turn drives the wheel hub. Positive lubrication keeps all moving parts bathed in lubricant to reduce friction, heat and wear.

Brake assemblies are hydraulically operated and are mounted within the brake drum. Hydraulic pressure is provided to the wheel cylinder by a brake master cylinder actuated when pressure is applied to the brake pedal mounted in the floorboard of the operator's compartment.

## AXLE APPLICATION

Following is a list of axles covered in this manual and the application of these axles.

Part No.	Model No.	Model Usage
130064	FD-17000	75A-I, 85A-I
130068	FD-24000	125A-I
130069	FD-24000-1	125A-I
131076	FD-17600	75A-II, (75A-I)
131078	FD-19000	85A-II, (85A-I)
131079	FD-24500	125A-II, (125A-I)
131597	FD-17600-4	75A-III
131599	FD-19000-2	85A-III

## DIFFERENCES IN MODELS

The following differences exist among the axles covered in this manual:

Part No.	Differential Ratio	Differential Pinion Spiral	Total Axle Ratio	Brake Size	Parking Brake Type
130064	6.333:1	L. H.	22.349:1	16-1/4 x 2-1/2	Wheel
130068	6.166:1	L. H.	22.611:1	16-1/4 x 2-1/2	Wheel
130069	6.166:1	L. H.	22.611:1	16-1/4 x 2-1/2	Wheel
131076	6.333:1	L. H.	22.353:1	17-1/4 x 4	Differential
131078	6.333:1	L. H.	22.353:1	17-1/4 x 4	Differential
131079	6.166:1	L. H.	22.611:1	17-1/4 x 4	Differential
131597	4.857:1	L. H.	17.143:1	17-1/4 x 4	Differential
131599	4.857:1	L. H.	17.143:1	17-1/4 x 4	Differential

## LUBRICATION

Proper lubrication is necessary to assure long periods of trouble-free operation. Not only is it important that the required lubrication schedule be maintained, but also that the proper type of lubricant be used. The following are the only lubricants recommended for use in these axles. Consult applicable Operator's Manual for machine model involved for capacities and lubrication schedules.

## DIFFERENTIAL AND PLANETARIES

\*SAE 90 Extreme Pressure Gear Lube, SCL Type (Sulfo-Chloro-Lead), per MS-8 Specifications given herein.

\*NOTE: When operating at ambient temperatures consistently below 0° F, use SAE 80 and when consistently above 100° F, use SAE 140. SAE 80 and SAE 140 grades when used should contain like additives specified for SAE 90 grade.

\* \* \* \* \*

EXTREME PRESSURE GEAR LUBE  
Specifications MS-8

Lubricants purchased under this specification shall be a well-refined mineral oil properly compounded with sulphur-chlorine-lead type extreme pressure additives. They shall be free of fillers or abrasives, such as fuller's earth, talc, graphite, cork, etc. They shall be stable, non-abrasive, and non-corrosive whether or not in the presence of small percentages of water.

## PHYSICAL AND CHEMICAL PROPERTIES

S. S. U @ 210° F .....	90-100 Seconds
S. S. U @ 100° F .....	1400 Seconds Max.
A. P. I. Gravity .....	14.4-15.9 Degrees
Pour Point .....	-10° F. Max.
Flash Point .....	350° F. Min.
Fire Point .....	400° F. Min.
Sulphur (Added) .....	1.20% Min.
Sulphur (Total) .....	3.00% Min.
Chlorine .....	1.20% Min.
Lead as Lead Oxide (PbO) .....	2.00% Min.
Moisture .....	.20% Max.
Load Carrying Capacity	
Timken Test Lever Load .....	70 lbs. Min.
Timken Abrasion Test (Total Loss) .....	2.0 mg. Max.
Heating Test	
Evaporation Loss .....	4.0% Max.
Viscosity Increase .....	10.0% Max.

## 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 Axle Assembly, Exploded View

Fig. B Differential and Carrier Assembly, Exploded View

Fig. C Brake Assembly, Exploded View

Fig. D Planet Spider Assembly, Exploded View

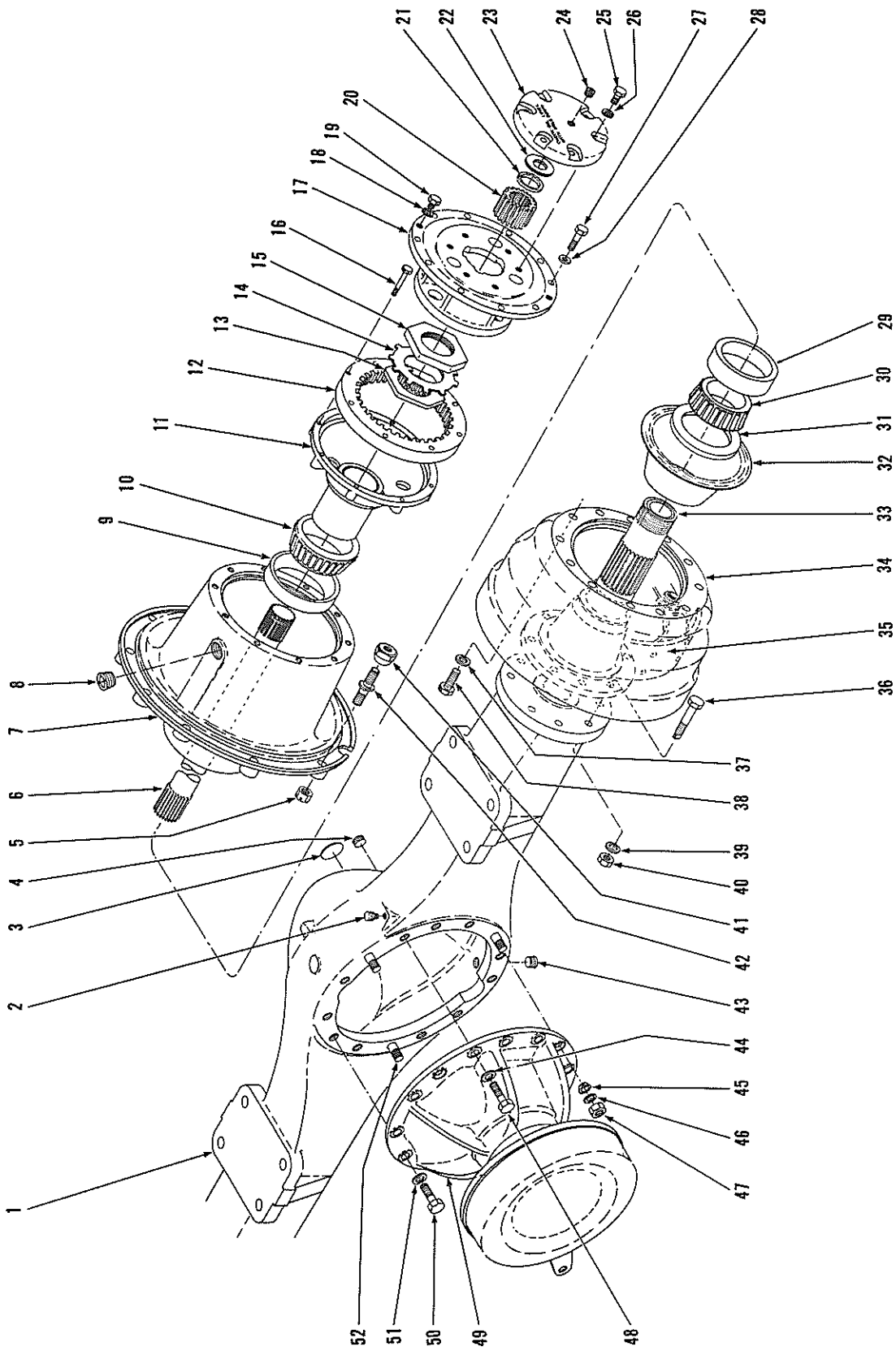
The following compounds, or their equivalent, are required for the overhaul of FD-17000, FD-19000, and FD-24000 series axles:

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.



## NOTES

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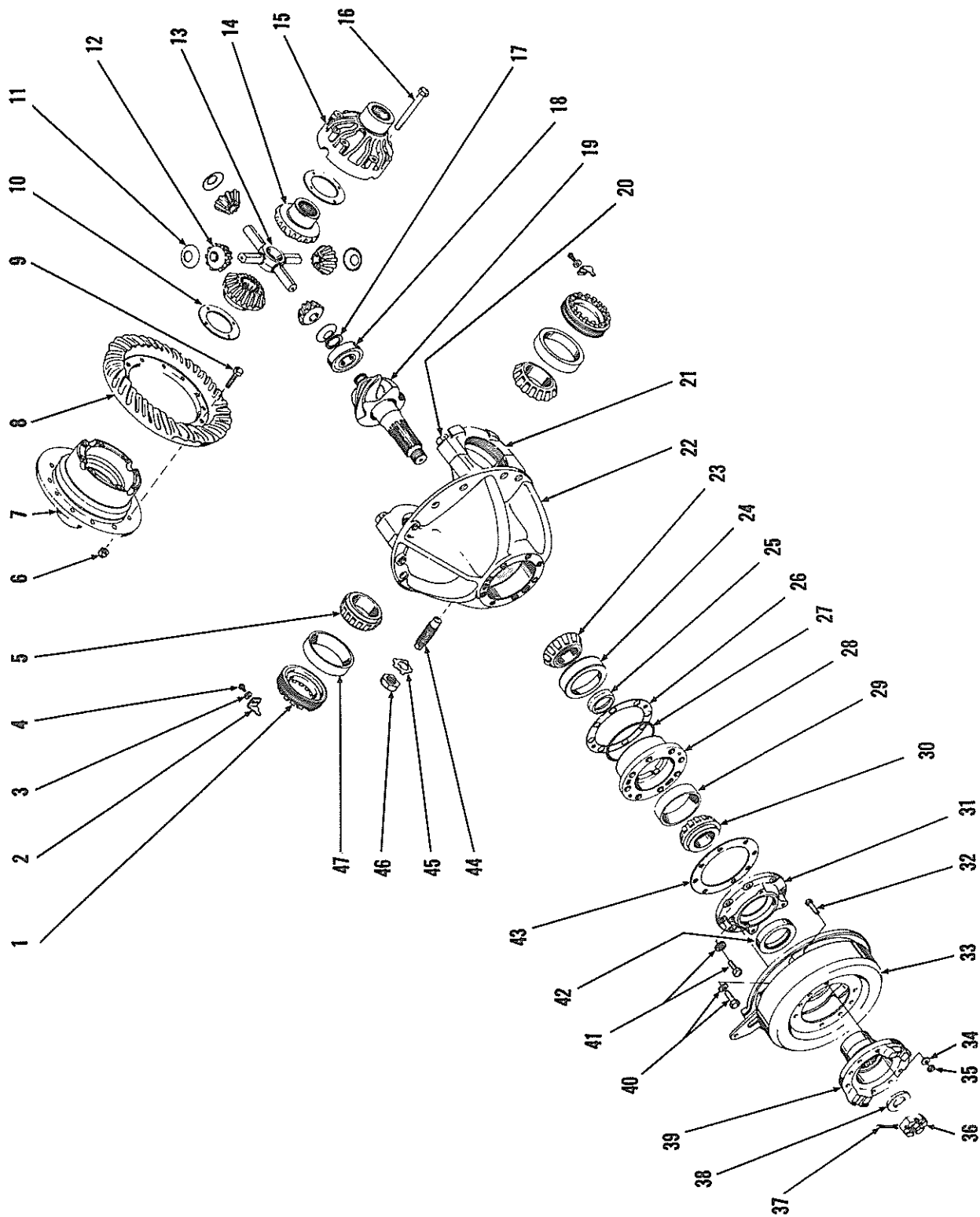
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FIG. A - AXLE ASSEMBLY

FIG. A

## AXLE ASSEMBLY

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



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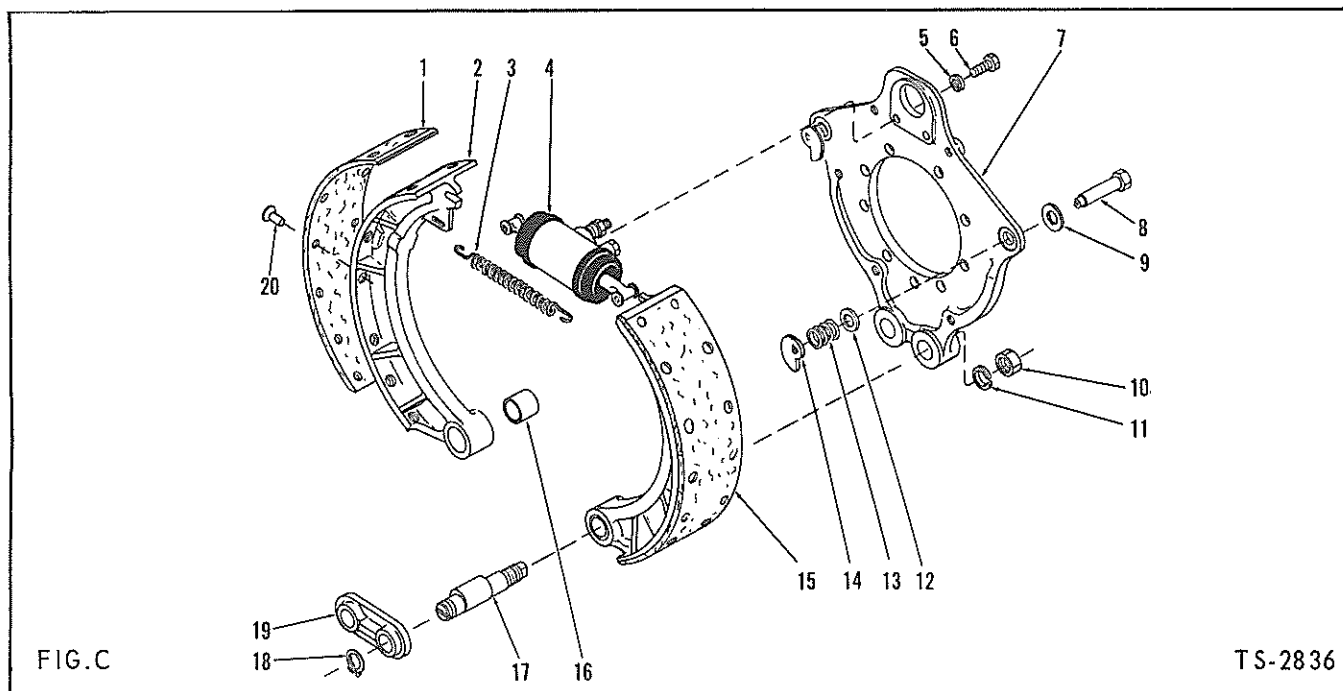
FIG. B - DIFFERENTIAL AND CARRIER ASSEMBLY

FIG. B

## DIFFERENTIAL AND CARRIER ASSEMBLY

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

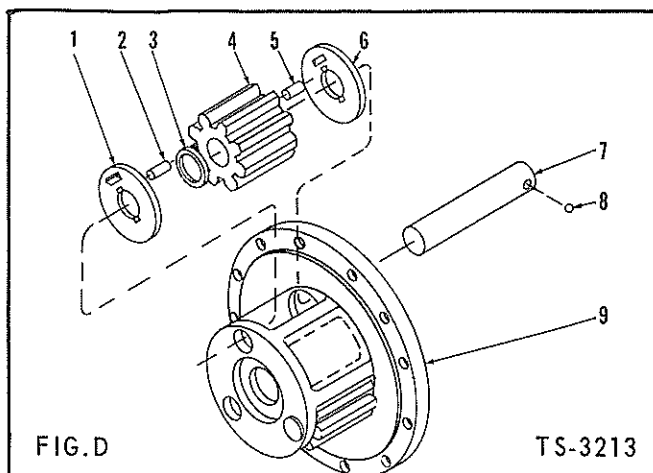
AR - As Required



## 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

Item No.	Description	No. Req'd.
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



## 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 mount-

ing pads to rest on crossbars of horses to provide necessary rigidity.

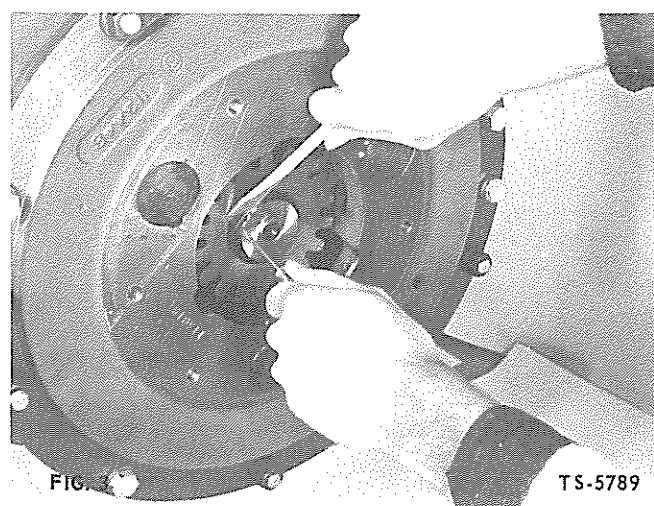
**CAUTION:** Cleanliness is of extreme importance in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

## DISASSEMBLY OF AXLE

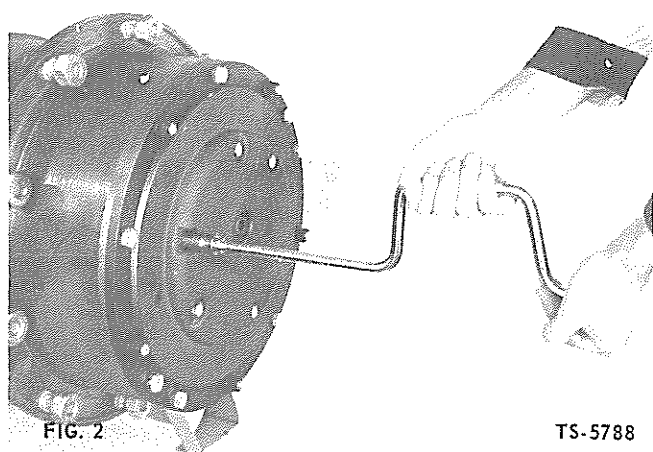
1. Remove drain plugs from planetary hub and from axle housing to drain axle (Fig. 1).



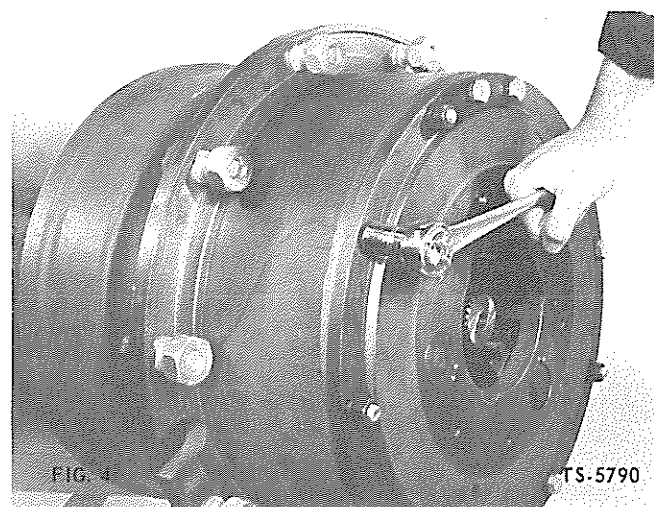
3. Remove sun gear retaining ring and remove sun gear (Fig. 3).



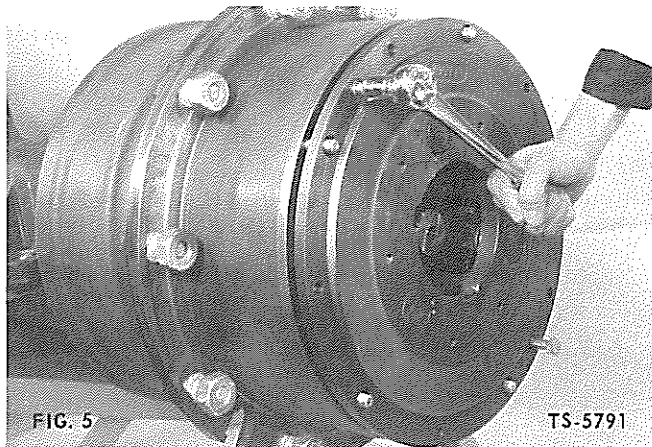
2. Remove bolts and washers securing sun gear thrust cap. Remove thrust cap (Fig. 2). If damaged, remove sun gear thrust cap washer from thrust cap.



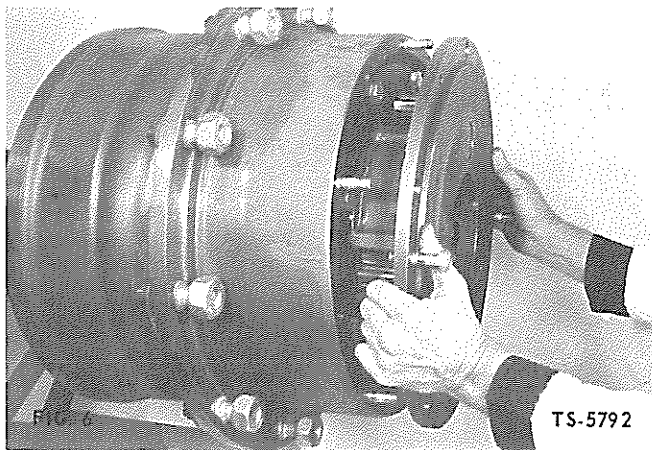
4. Remove bolts, washers, and stud nuts from planet spider assembly (Fig. 4).



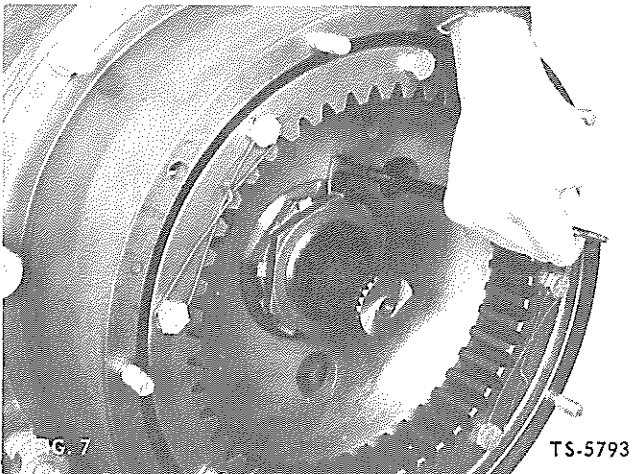
5. Install two mounting bolts in puller holes to pull planet spider assembly from hub assembly (Fig. 5).



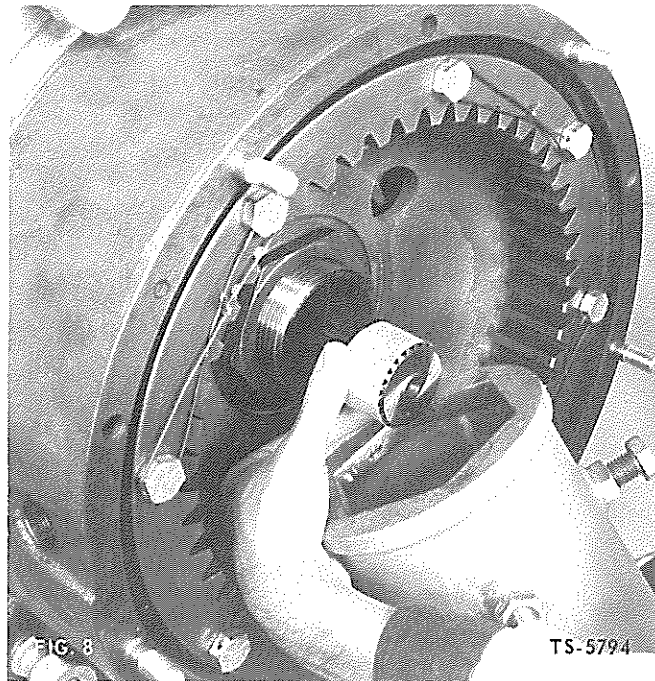
6. Remove planet spider assembly (Fig. 6). Take care not to lose tapered dowels used to align spider to studs.



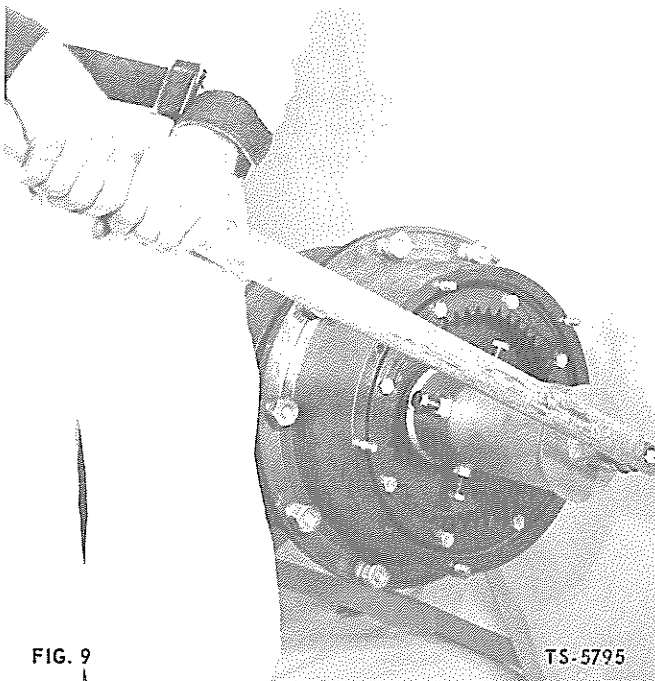
7. Straighten tangs on nut lock as shown in Fig. 7.



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.

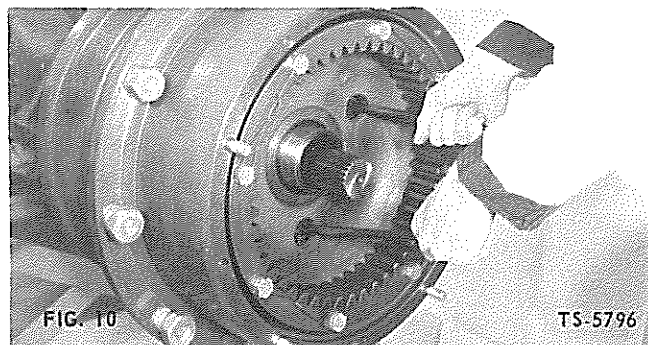


9. Remove outer spindle nut, spindle nut lock, and inner spindle nut (Fig. 9).

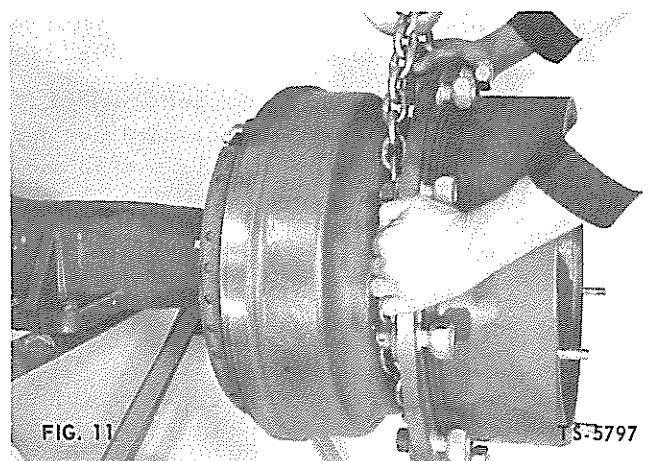




10. Support weight of brake drum and hub assembly with hoist. Remove internal gear and hub from spindle (Fig. 10). In some cases, it will be necessary to use pry bars as shown.

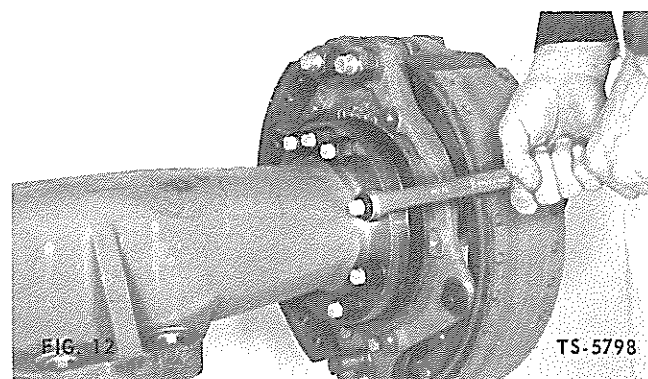


11. Pull straight out on brake drum and hub assembly to remove it from axle (Fig. 11).

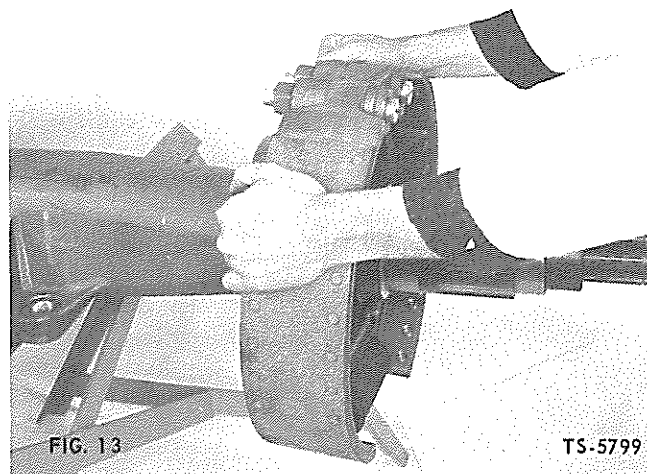


12. Remove bolts and nuts securing brake spider and spindle to axle housing (Fig. 12).

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

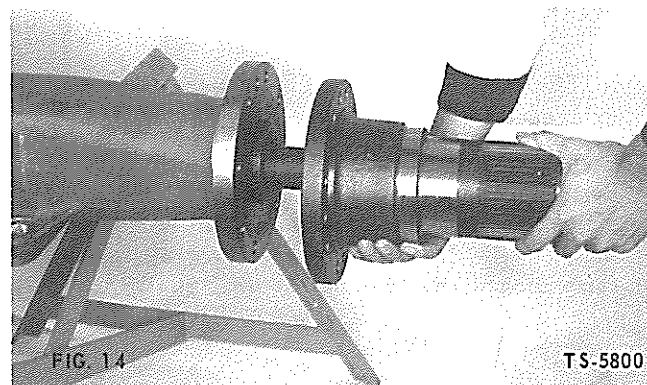


13. Remove brake assembly from the spindle assembly (Fig. 13).

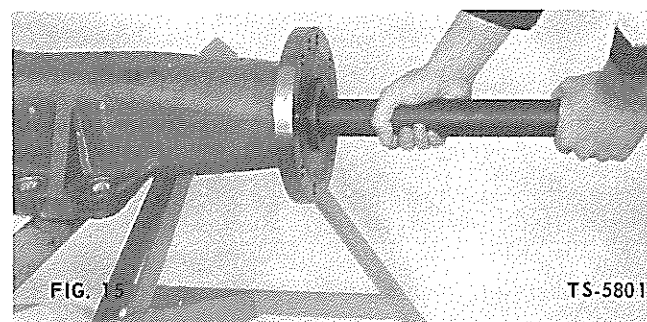


14. Pull straight out on spindle assembly to remove it from axle housing (Fig. 14).

**NOTE:** Spindles of axle Part Nos. 130064, 131076, and 131597 are integral with axle housings and cannot be removed. Bolts, washers, and nuts secure brake discs to axle housings.

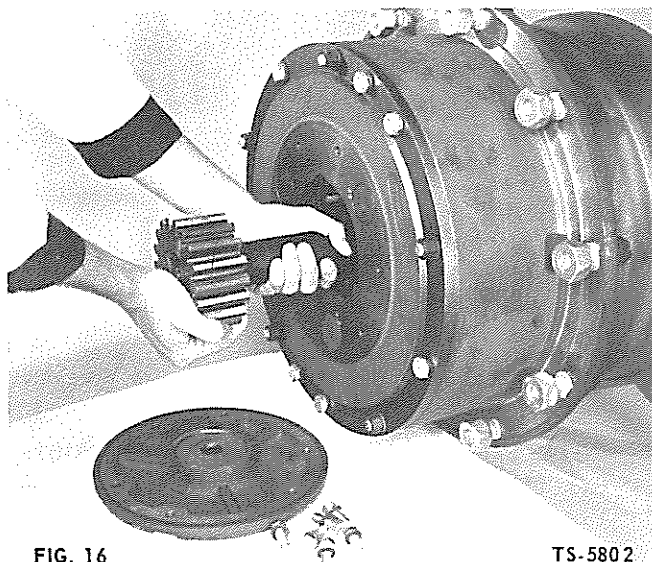


15. Pull straight out to remove axle shaft assembly (Fig. 15).



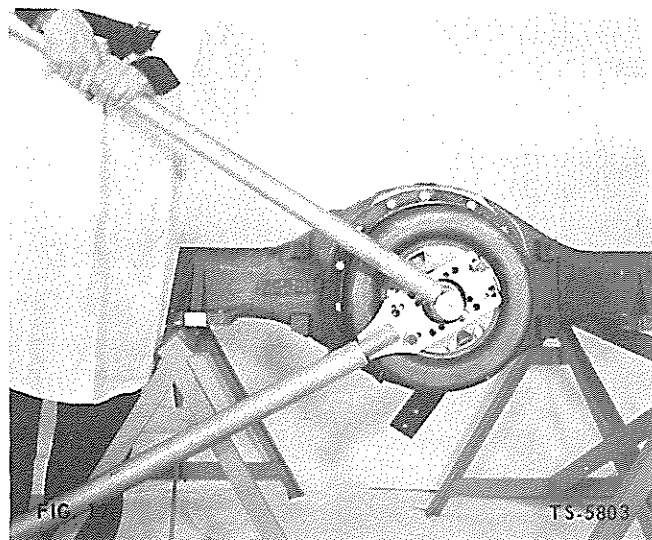
16. Disassemble opposite side of axle following instructions given in steps 2 through 15.

**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.

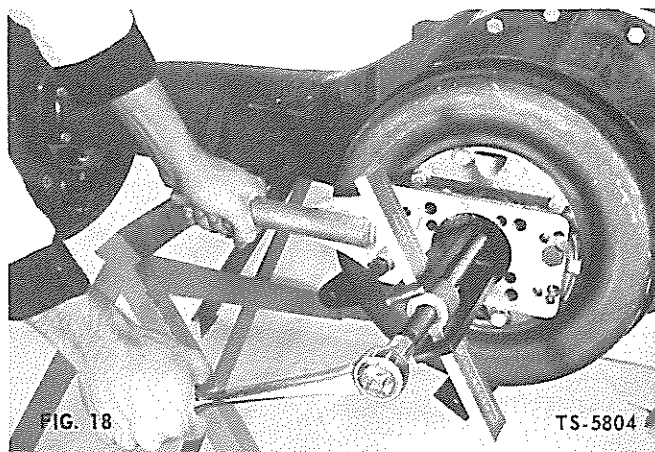


**NOTE:** Steps 17 through 22 are necessary only if axle assembly is equipped with parking brake. If parking brake is not provided, proceed to step 23.

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).

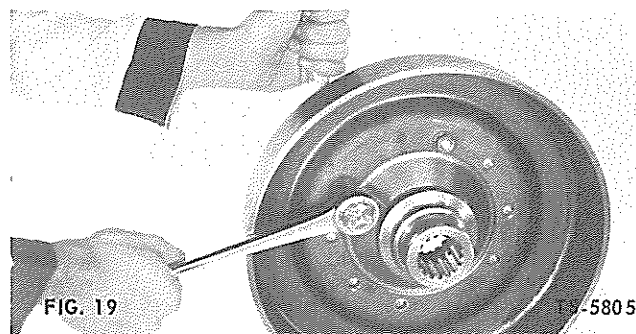


18. Pull assembled parking brake drum and companion flange from differential pinion shaft (Fig. 18).

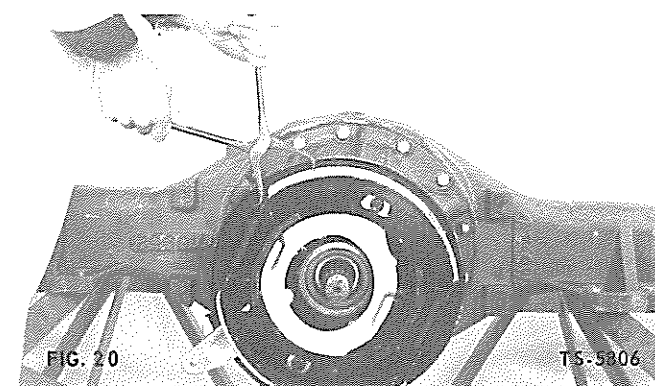


19. If brake drum or companion flange is damaged, remove bolts, nuts, and lockwashers securing parking brake drum to companion flange (Fig. 19).

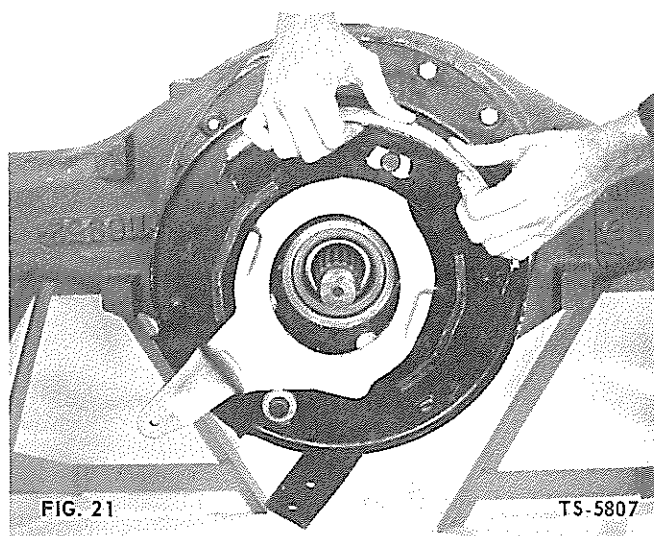
**NOTE:** Some brake drums have bolts welded to companion flange. On these units remove nuts and lockwashers securing parking brake drum to companion flange.



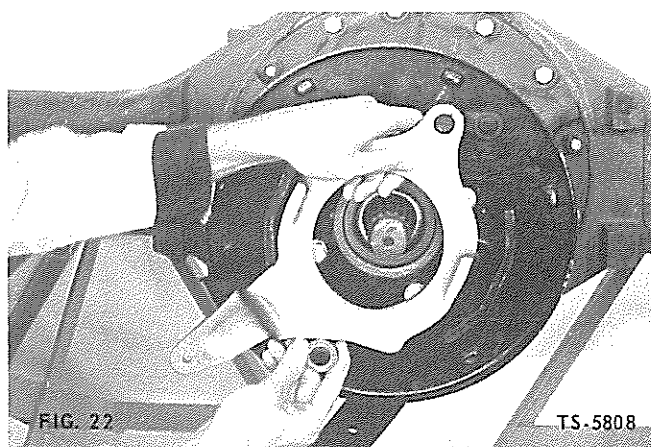
20. Use brake spring pliers to remove brake shoe return springs from parking brake shoes (Fig. 20).



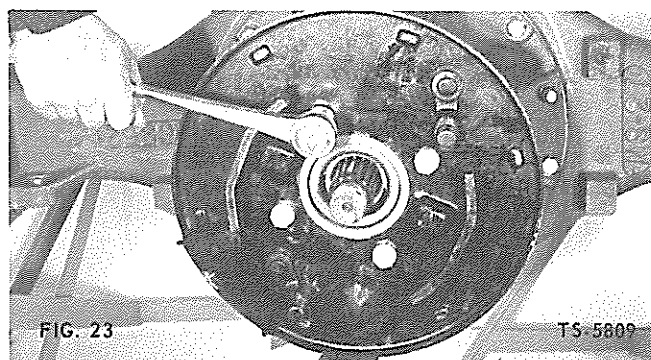
21. Remove brake shoes (Fig. 21).



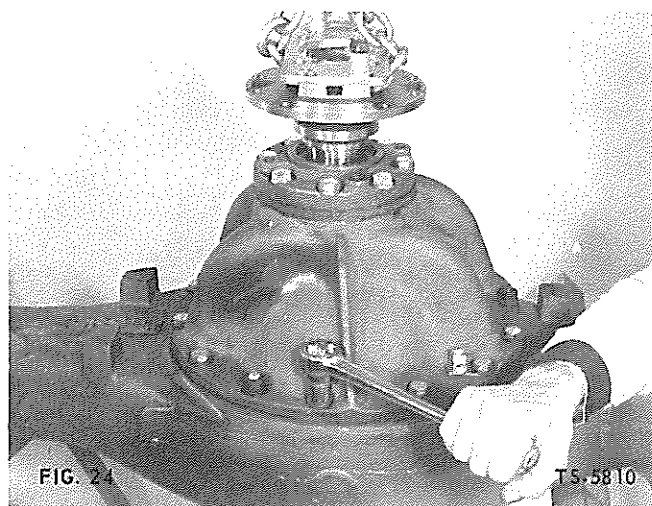
22. Remove operating cam lever and brake actuating roller (Fig. 22).



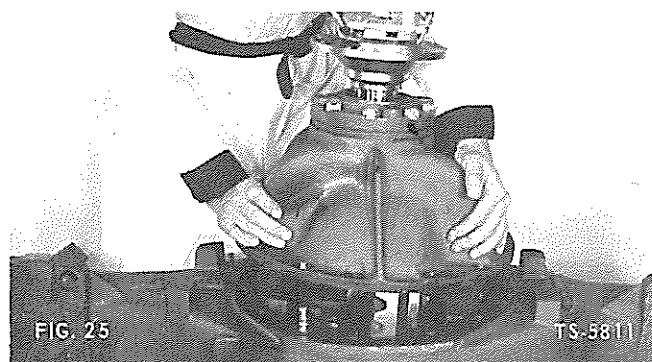
23. Remove bolts securing brake backing plate to differential (Fig. 23). Temporarily reinstall companion flange on pinion shaft with nut and washer to facilitate hoisting differential.



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

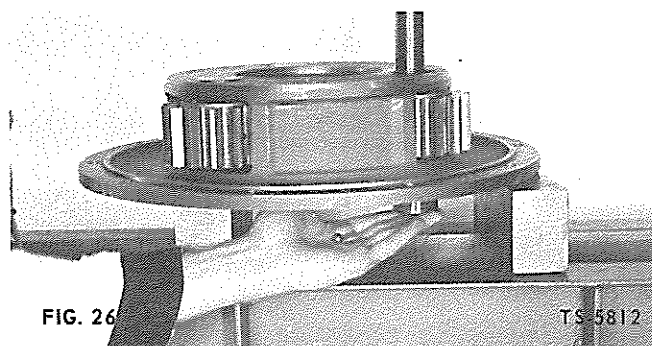


25. Carefully hoist differential from housing (Fig. 25). It may be necessary to tap housing with soft mallet to break seal.

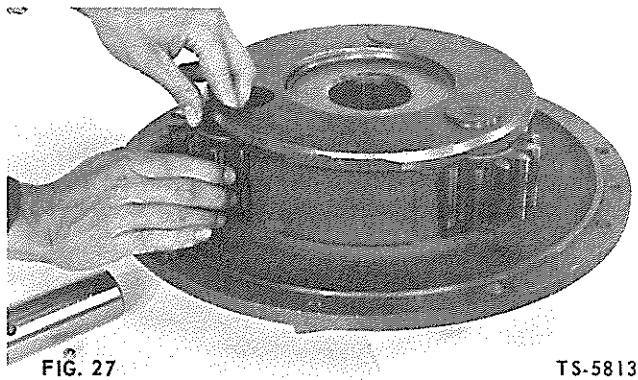


## Disassembly of Planet Spider Assembly

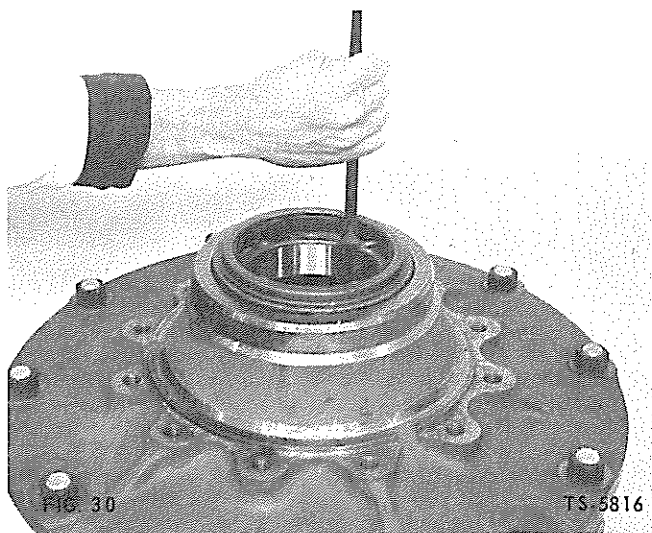
1. Place planet spider assembly in press as shown in Fig. 26, and press out pinion shaft securing pinion to spider. Take care to catch pinion shaft ball released by shaft movement.



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.

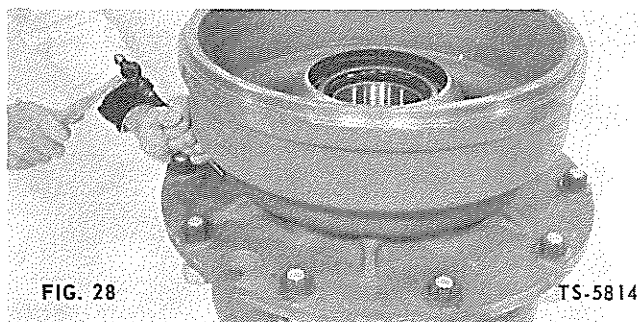


3. Pry out oil seal (Fig. 30).

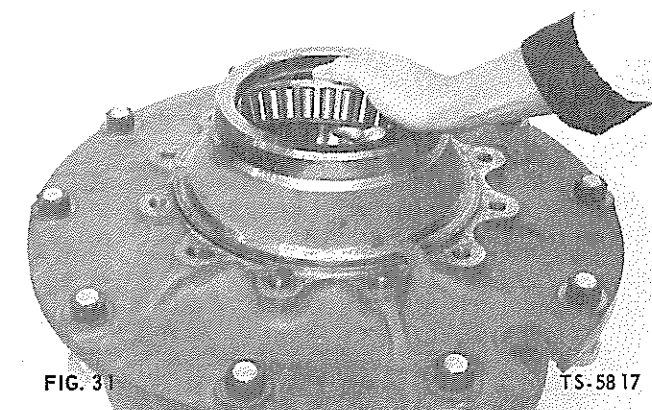


## Disassembly of Hub and Drum Assembly

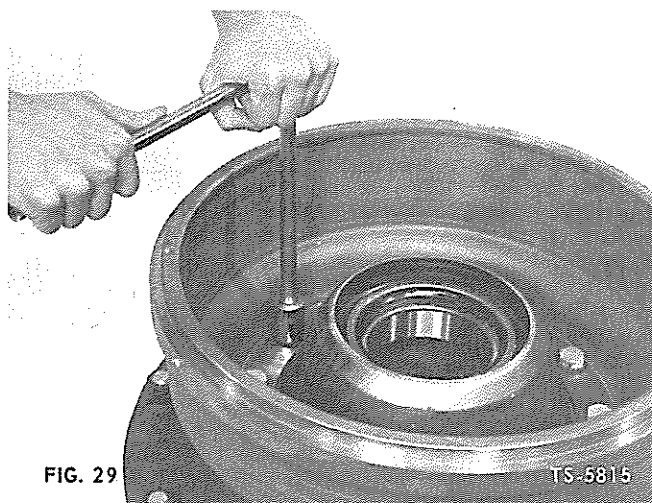
1. Matchmark hub and drum to insure proper reassembly (Fig. 28).



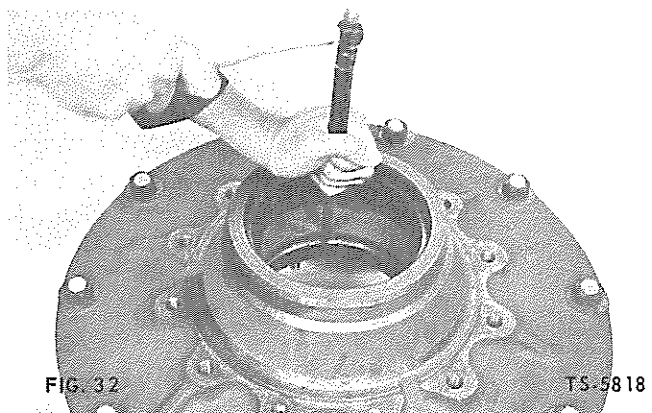
4. Lift out bearing cone (Fig. 31).



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



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.





## Disassembly of Internal Gear and Hub

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

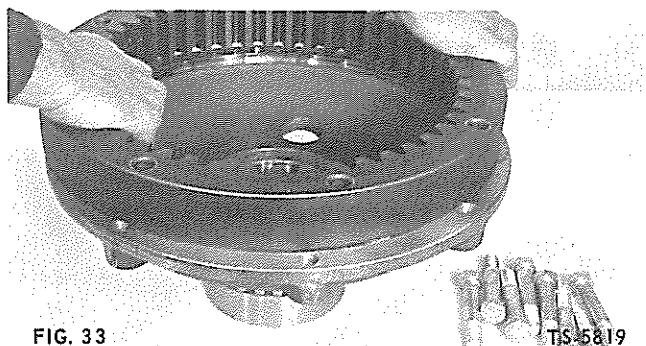


FIG. 33

TS-5819

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

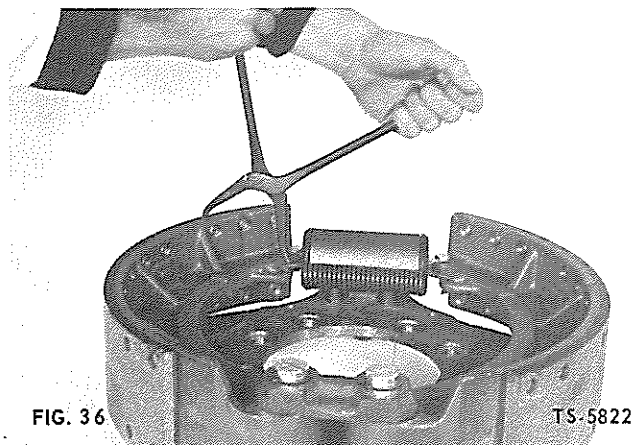


FIG. 36

TS-5822

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

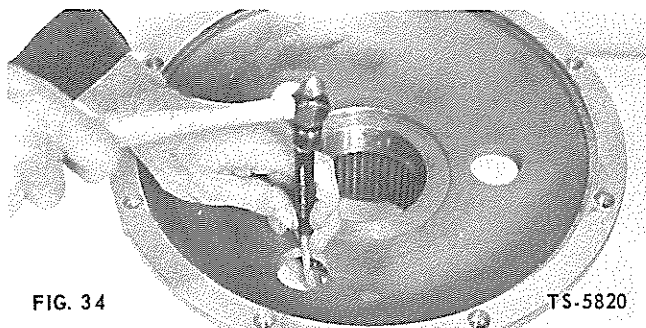


FIG. 34

TS-5820

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

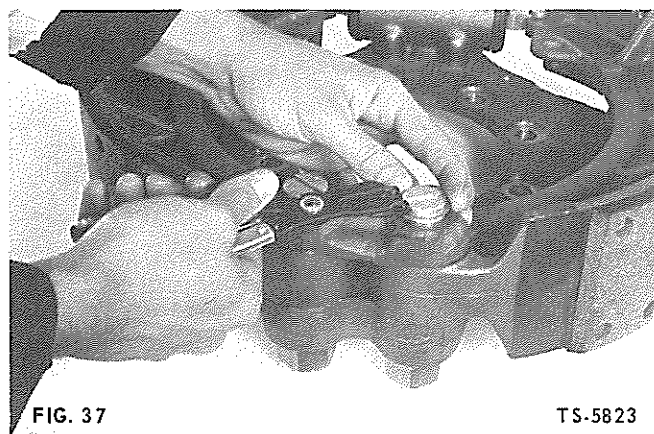


FIG. 37

TS-5823

## 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).

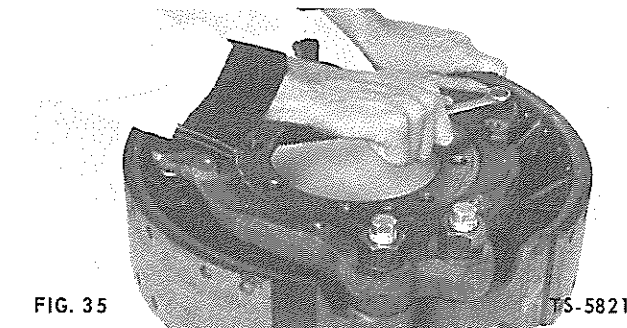


FIG. 35

TS-5821

4. Remove brake shoes (Fig. 38).

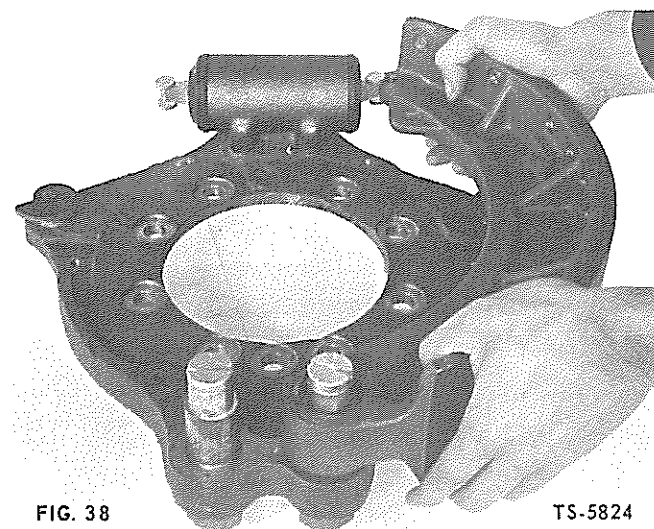
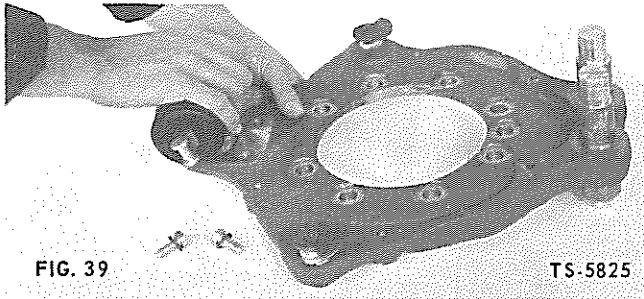


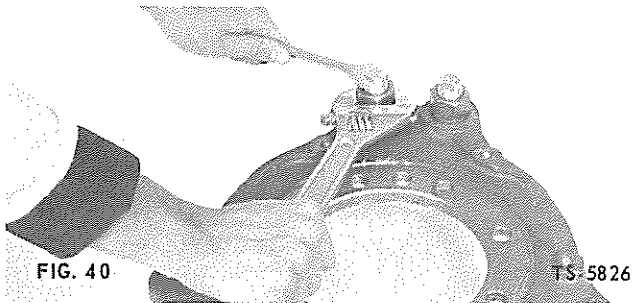
FIG. 38

TS-5824

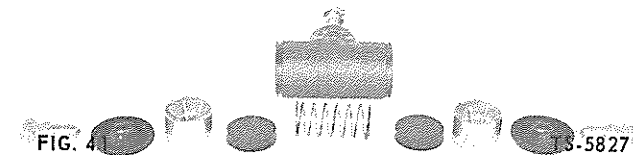
5. Remove two bolts securing wheel cylinder to brake disc and lift off cylinder (Fig. 39).



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

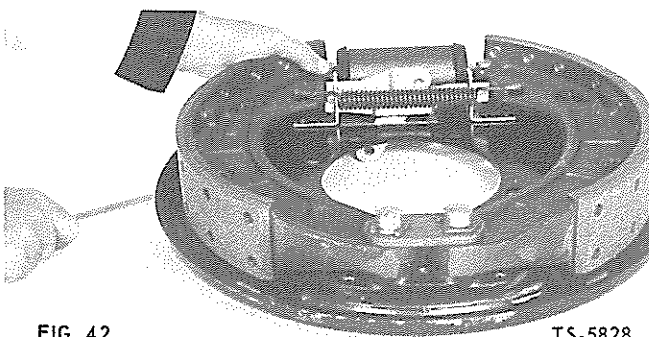


7. Remove push rods and boots from ends of cylinder. Remove pistons, cups, and spring (Fig. 41).

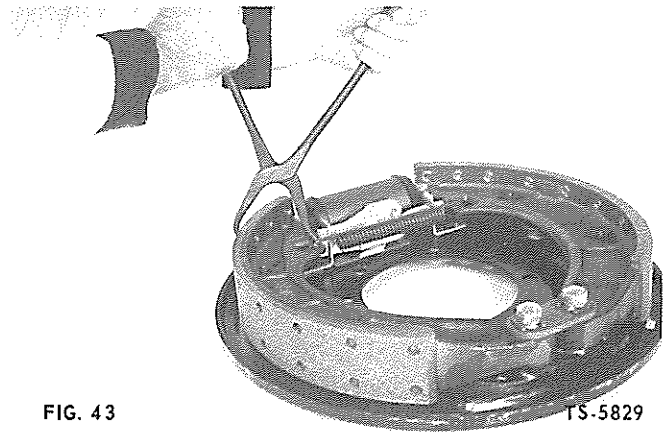


## Brakes Using Stamped Disc as Backing Plate

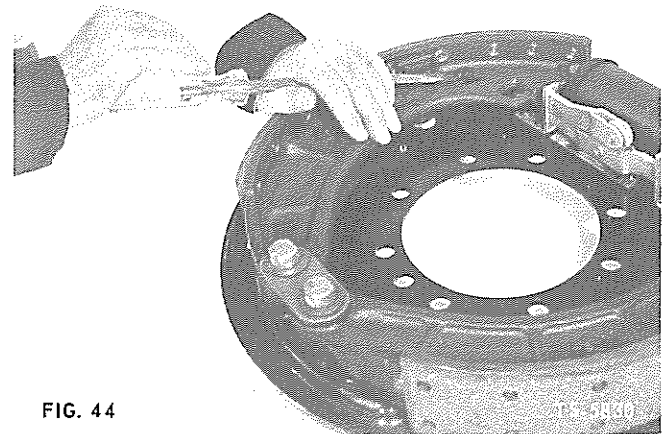
1. Rotate brake shoe adjusting cam to reduce brake return spring tension to a minimum (Fig. 42).



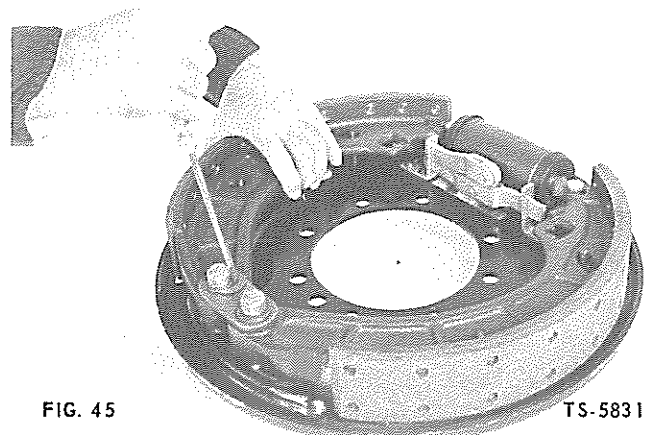
2. Remove brake shoe return spring with brake spring pliers (Fig. 43).



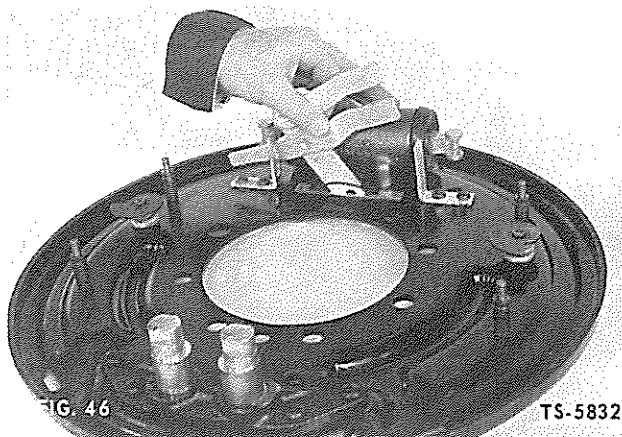
3. Remove guide pin "C" washers and guide pin washers (Fig. 44).



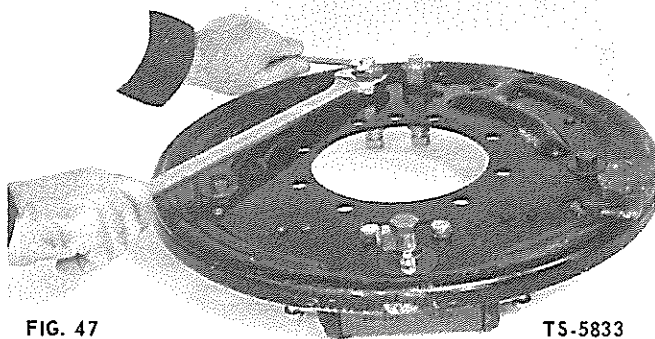
4. Remove anchor pin "C" washers and strut (Fig. 45). Lift off brake shoes.



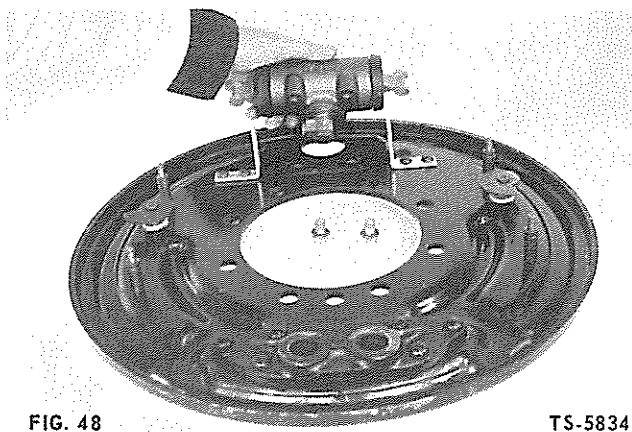
5. Slide parking brake actuator to one side to disengage it from one of its brackets. Lift parking brake actuator from other bracket (Fig. 46).



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



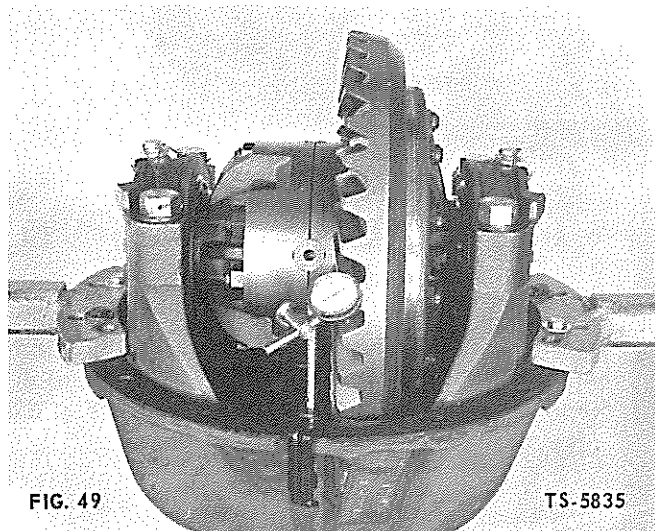
7. Remove two bolts and lockwashers securing wheel cylinder to brake disc and lift off cylinder (Fig. 48).



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

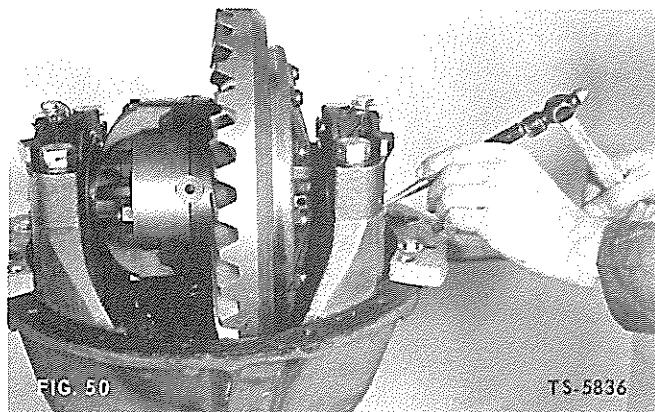
## Disassembly of Differential

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).

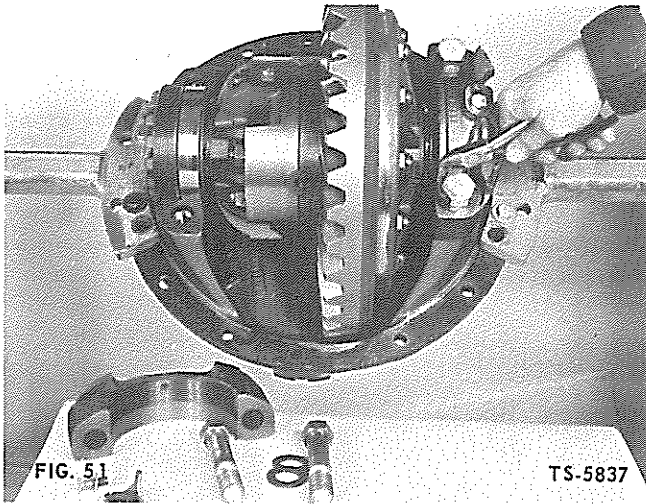


2. If axle is not equipped with parking brake so that companion flange was not removed previously, install companion flange retainer tool, remove cotter pin, and loosen nut securing flange to pinion shaft in manner similar to that shown in Fig. 17. This will facilitate later companion flange removal.

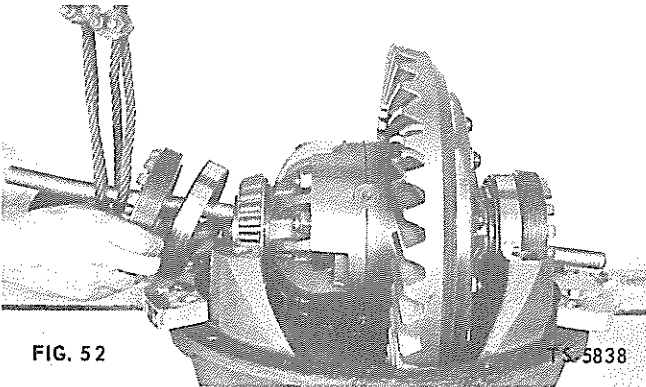
3. Use center punch to matchmark differential carrier caps to carrier assembly. This is to insure correct match in reassembly (Fig. 50).



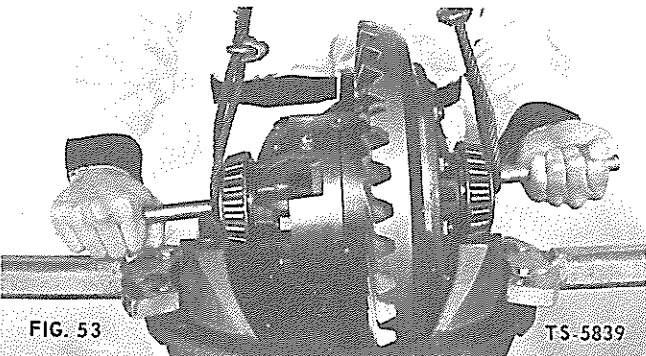
4. Remove lockwire and differential adjusting nut lock. Remove bearing cap bolts and bearing caps (Fig. 51).



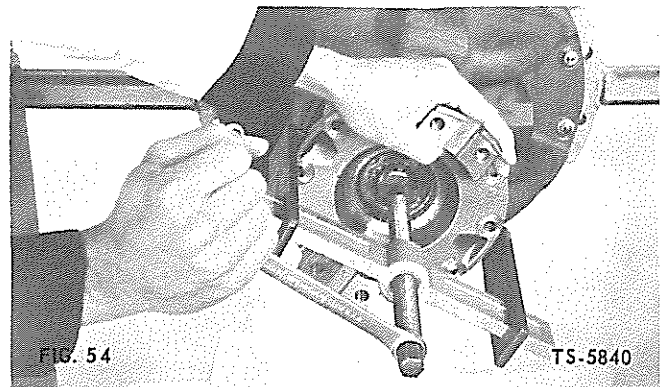
5. Insert metal bar through differential to facilitate hoisting. Raise ends individually and remove differential adjusting nuts and bearing cups (Fig. 52).



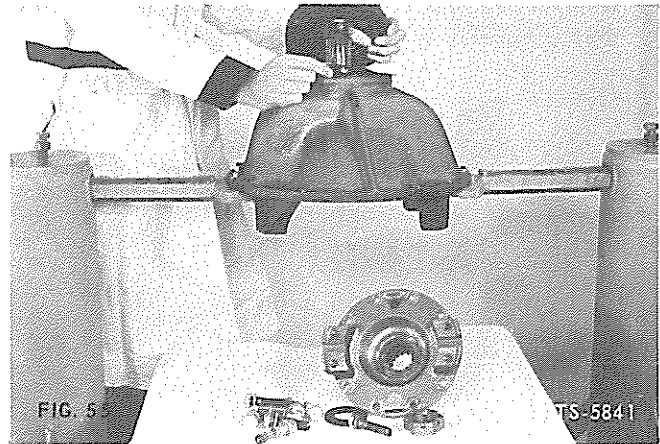
6. Hoist differential from carrier assembly. Tilt differential assembly slightly to permit ring gear to clear pinion shaft inner bearing boss in carrier assembly (Fig. 53).



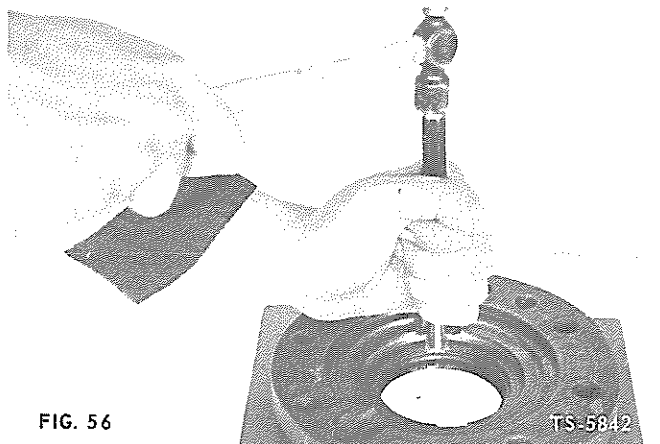
7. Remove pinion shaft nut that was loosened previously. Remove washer. Remove companion flange from pinion shaft with puller (Fig. 54).



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.

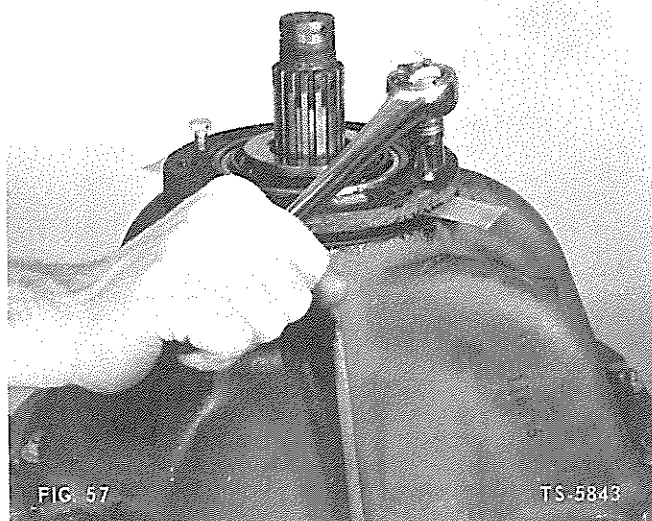


9. Drive pinion oil seal from pinion oil seal retainer (Fig. 56).

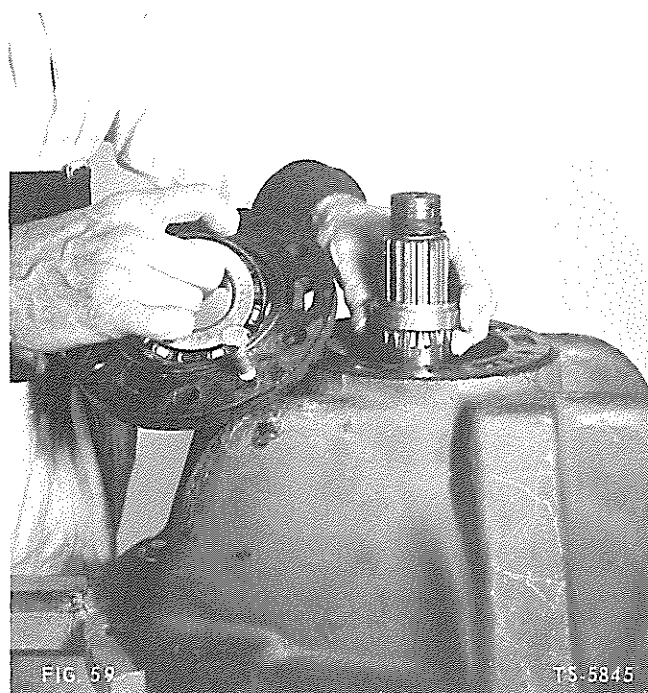




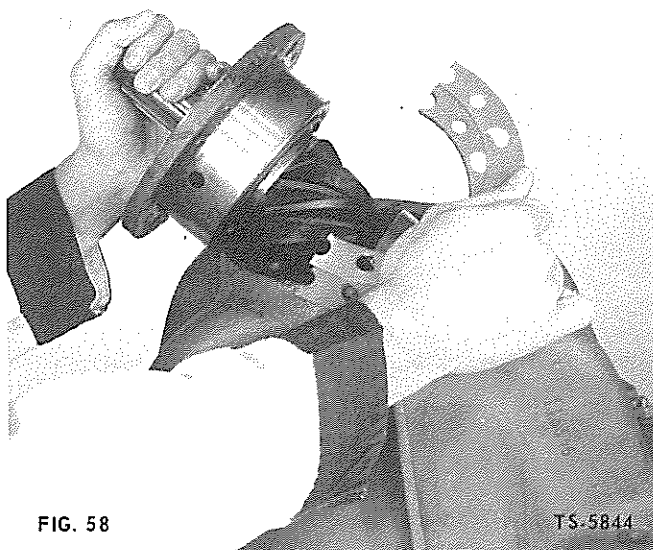
10. Screw two bolts (3/8-16 threads) in puller holes and pull bearing cage from carrier assembly (Fig. 57). Turn each bolt equally to prevent damage to carrier, shaft, or bearings. After bearing cage is pulled out a short distance, back off puller screws and insert .030 inch shim stock under puller screws, before pulling is continued, to reduce possible damage to shim pack under flange of bearing cage.



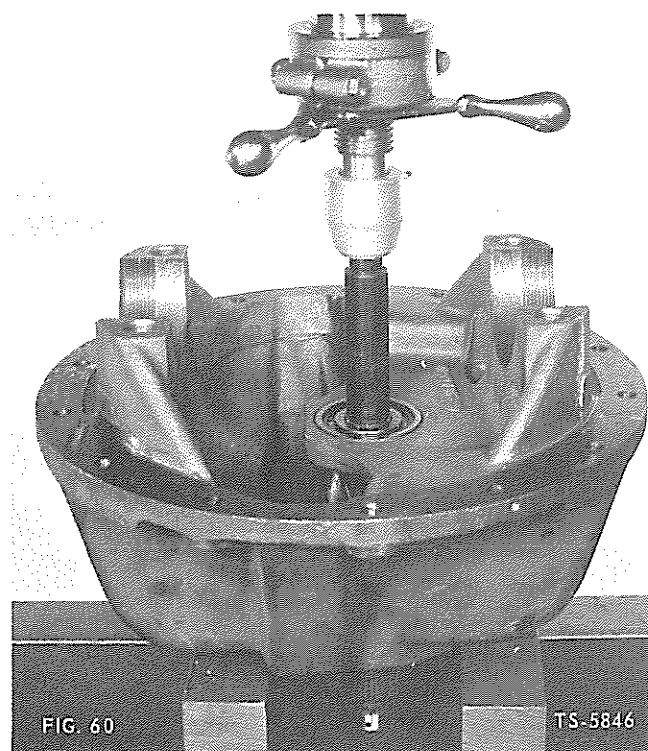
12. On axle Part Nos. 130064, 131076, and 131597, remove outer pinion bearing cone, bearing cage assembly, and bearing spacer (Fig. 59).



11. On axle Part Nos. 130068, 130069, 131078, 131079, and 131599, remove pinion shaft assembly from carrier (Fig. 58). Remove bearing cage shims. Retain bearing cage shim pack intact for possible reuse in reassembly.

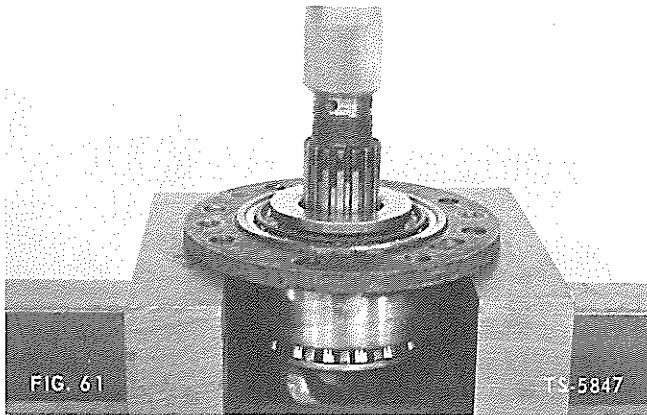


13. Press pinion shaft assembly and center bearing cup from carrier (Fig. 60).

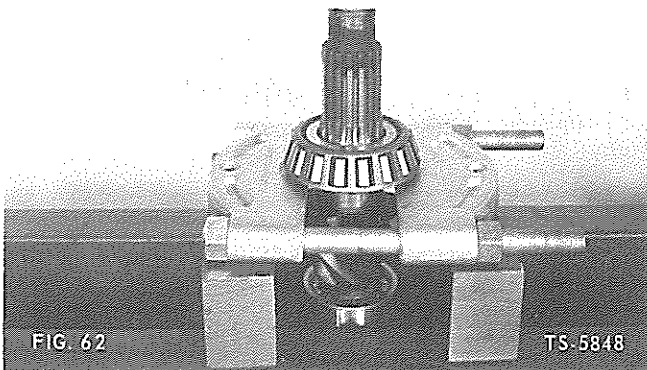


## Disassembly of Pinion Shaft Assembly

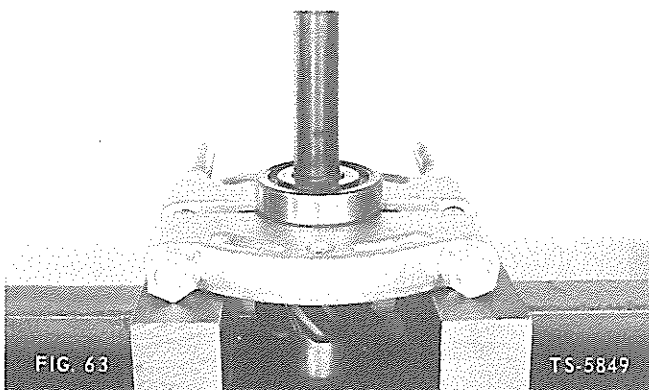
1. On axle Part Nos. 130068, 130069, 131078, 131079, and 131599, press pinion shaft from pinion bearing cage assembly. This will release outer pinion bearing cone (Fig. 61). On axle Part Nos. 130064, 131076, and 131597, this step was accomplished during removal of bearing cage.



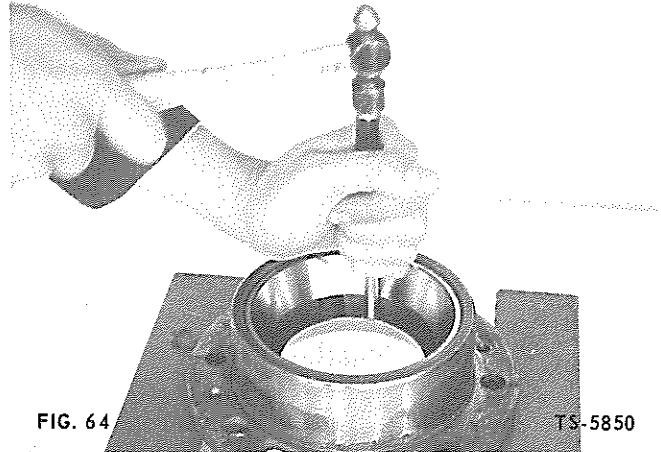
2. Press center pinion bearing cone from pinion assembly (Fig. 62).



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

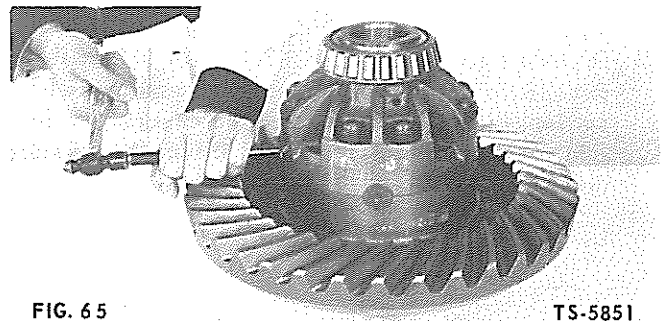


4. If worn or damaged, drive both bearing cups from pinion bearing cage (Fig. 64) for axle Part Nos. 130068, 130069, 131078, 131079, and 131599. Axle Part Nos. 130064, 131076, and 131597 have only one bearing cup in the pinion cage.

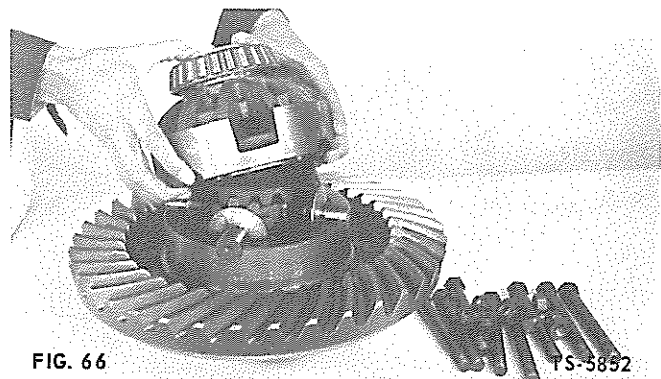


## Disassembly of Differential Case and Ring Gear

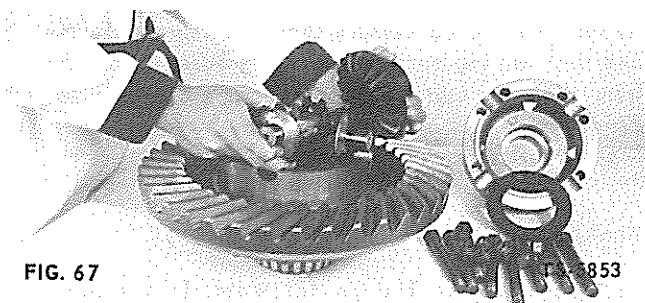
1. Matchmark case halves to insure correct reassembly (Fig. 65).



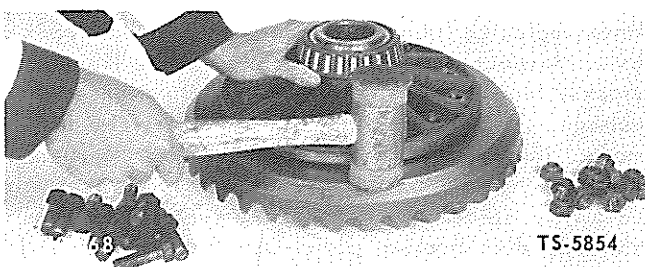
2. Remove differential case bolts and nuts securing case halves. Lift off case half (Fig. 66). Use soft mallet if necessary to aid removal.



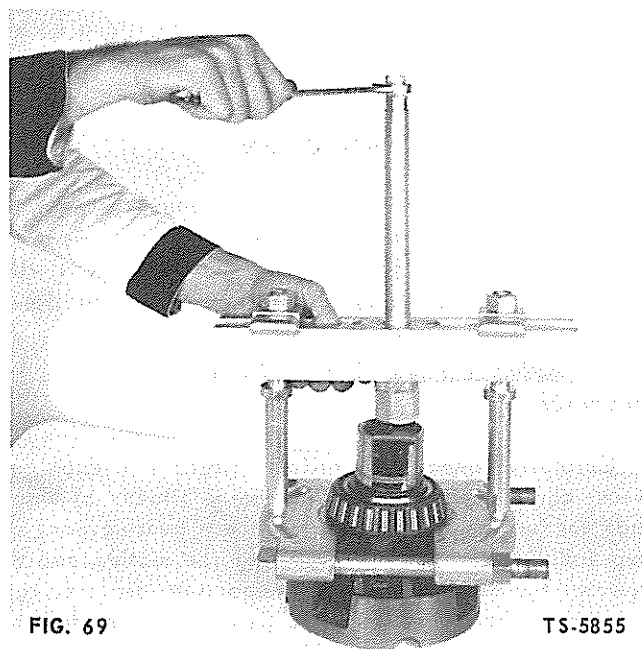
3. Remove side gears, spider, pinions, and thrust washers (Fig. 67).



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



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



## 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.

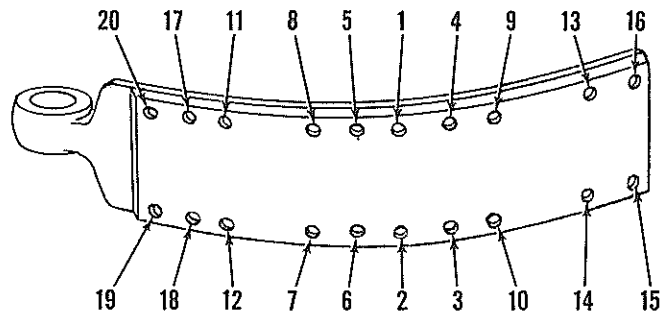


FIG. 70

TS-5856

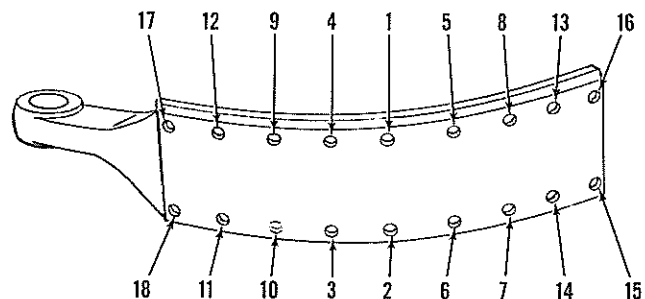


FIG. 71

TS-5857

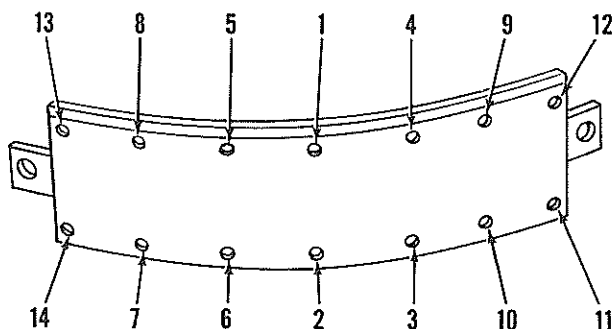


FIG. 72

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.

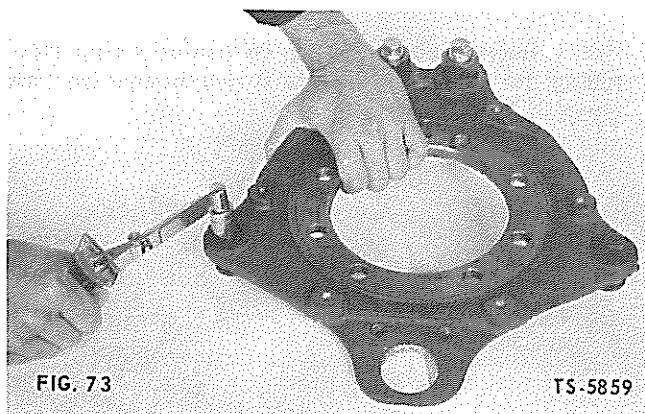


FIG. 73

TS-5859

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

Axle Part No.	Drum Internal Diameter (inches)	Brake Shoe Pin Internal Diameter (inches)
130064	16.37	1.012
130068	16.37	1.012
130069	16.37	1.012
131076	17.37	1.261
131078	17.37	1.261
131079	17.37	1.261
131597	17.37	1.261
131599	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.

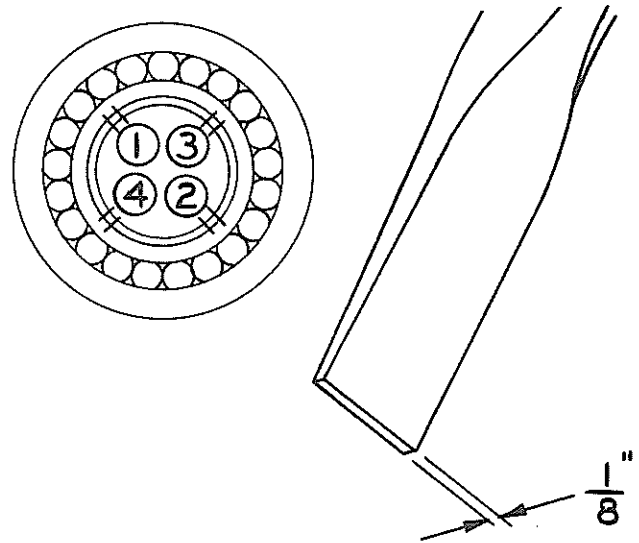
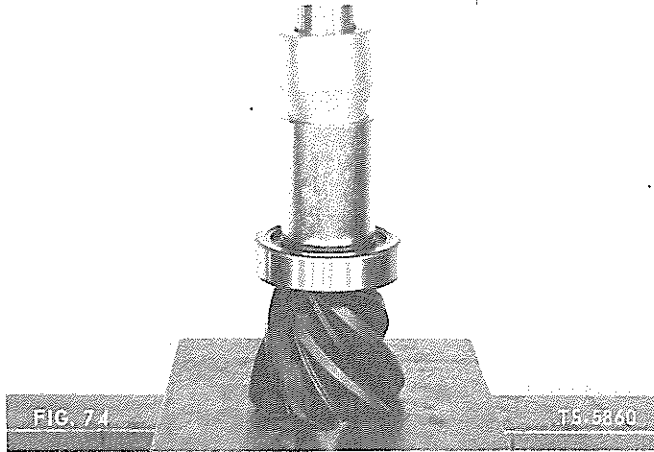


FIG. 77

TS-5402

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

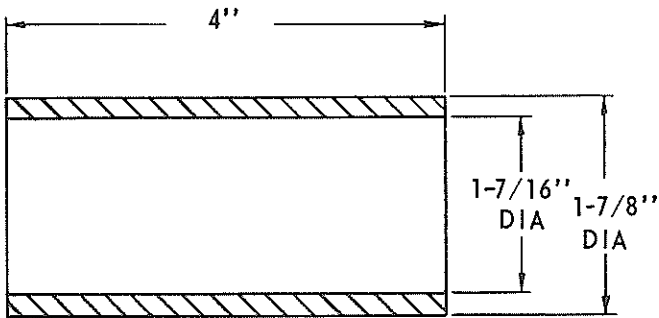


FIG. 75

TS-5861

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

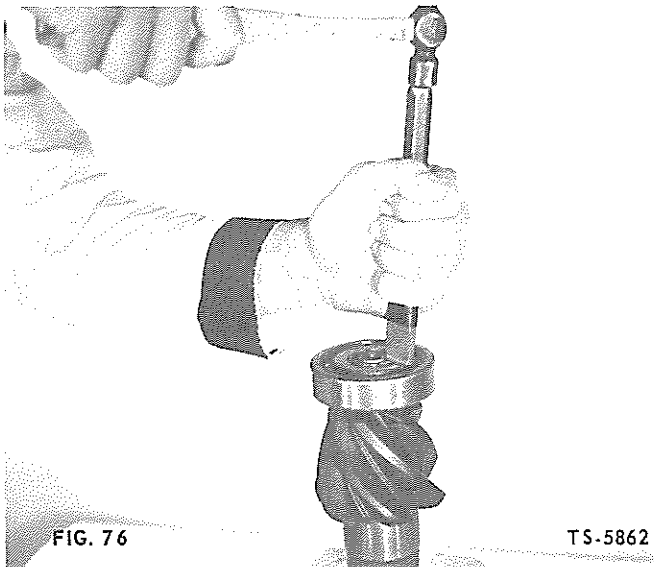


FIG. 76

TS-5862

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).

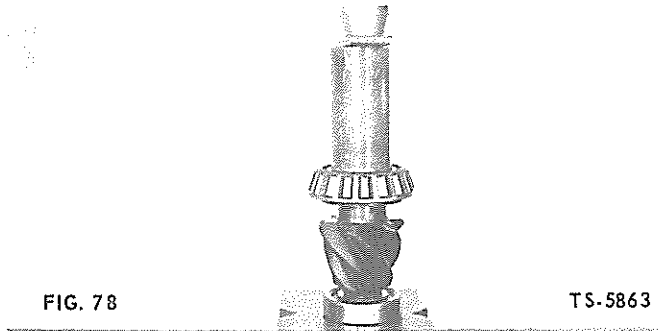


FIG. 78

TS-5863

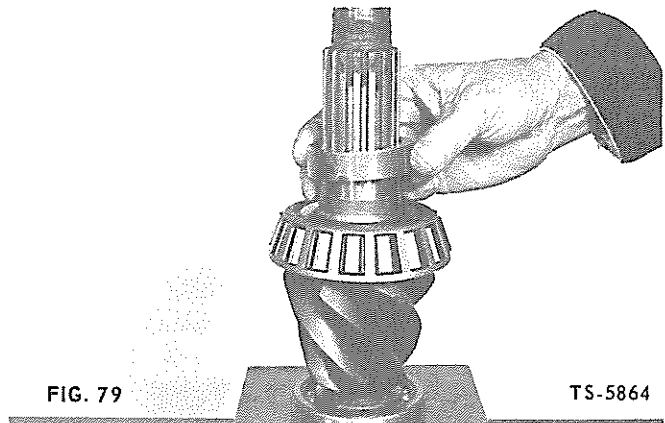


FIG. 79

TS-5864

5. On axle Part Nos. 130068, 130069, 131078, 131079, and 131599, press both bearing cups into pinion bearing cage (Fig. 80). Bearing driver dimensions are shown in Figs. 81 and 82. Axle Part Nos. 130064, 131076, and 131597 have only one bearing cup; press it into bearing cage using driver with dimensions as shown in Fig. 83.

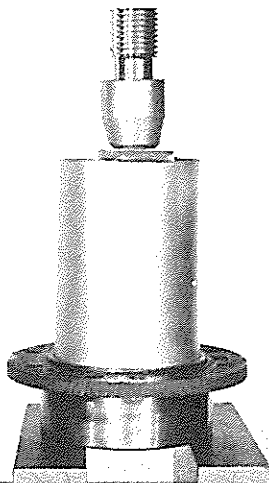


FIG. 80

TS-5865

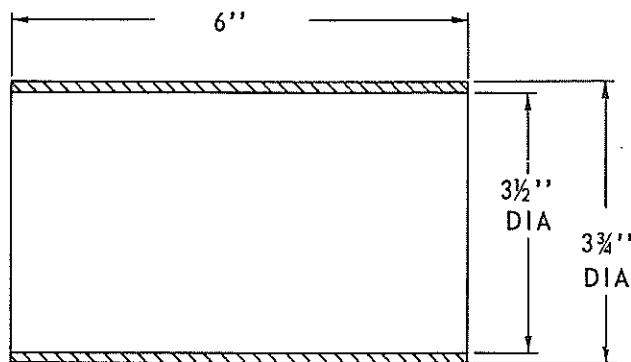


FIG. 83

TS-5868

**NOTE:** Mounting of differential pinion differs, requiring different reassembly procedure. Refer to steps 6 and 7 for axle Part Nos. 130068, 130069, 131078, 131079, and 131599. Refer to steps 8 through 10 for axle Part Nos. 130064, 131076, and 131597.

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.

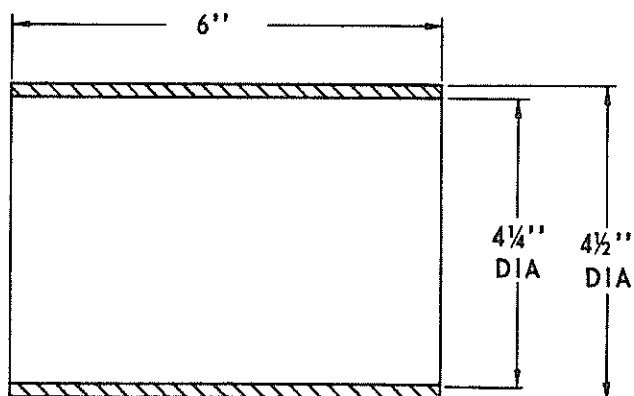


FIG. 81

TS-5866

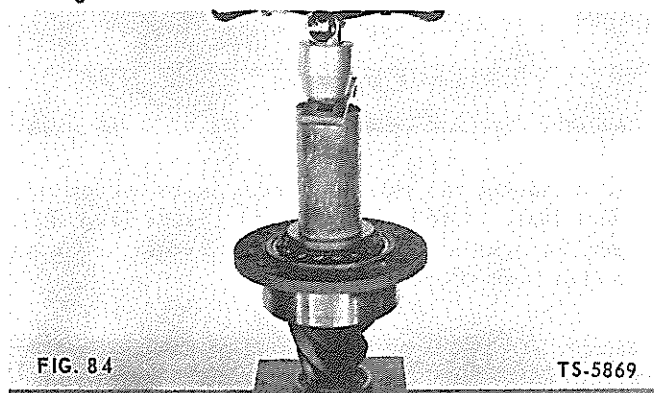


FIG. 84

TS-5869

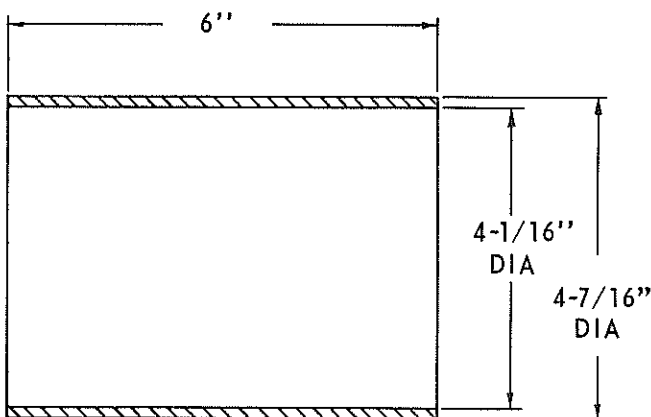


FIG. 82

TS-5867

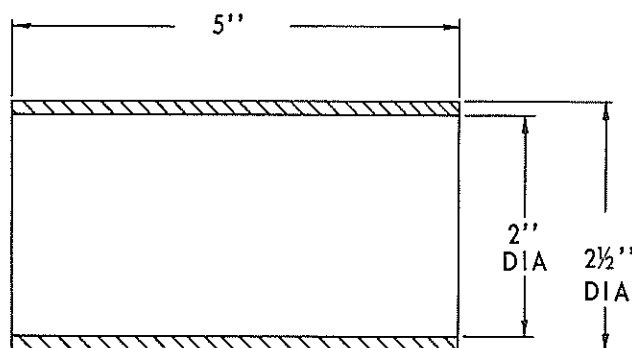


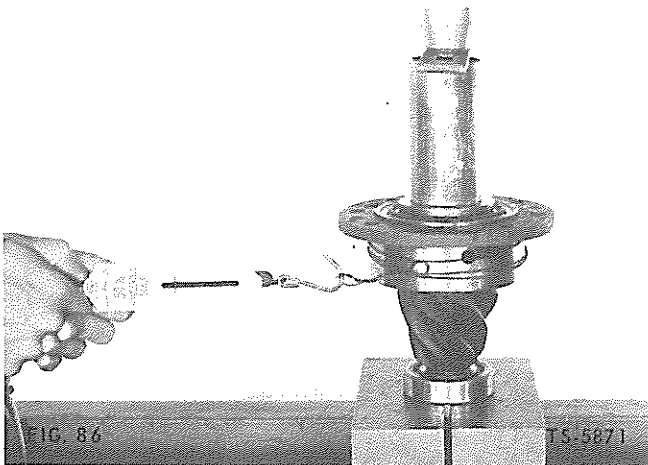
FIG. 85

TS-5870

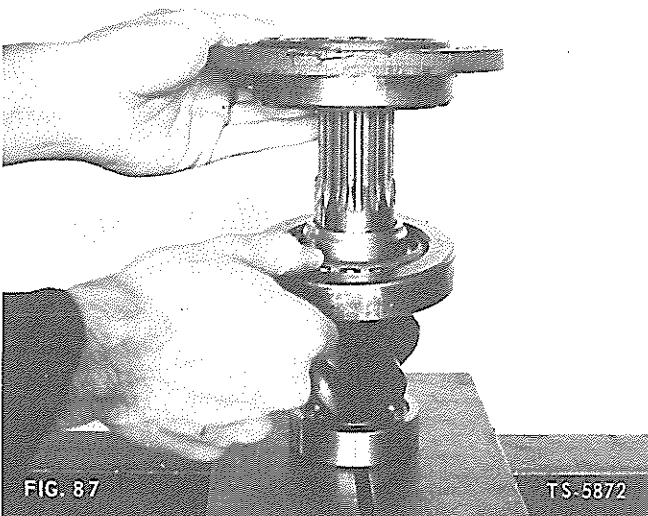


7. Keep pinion and cage assembly in press with about 500 pounds of press pressure exerted on driver. Wrap several turns of soft wire or cord around pinion cage and pull in horizontal line with spring scale. While pulling in straight line (90 degrees from centerline of shaft), read spring scale and measure 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.

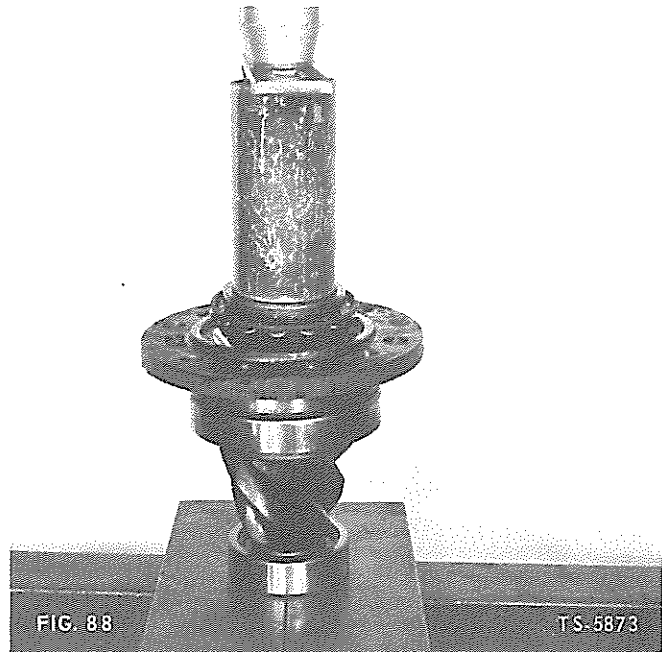
**NOTE:** This is a preliminary check. Final bearing preload check must be made with pinion shaft and bearing assembly in differential carrier housing.



8. After spacer and shim have been installed for axle Part Nos. 130064, 131076, and 131597 (Fig. 79), position center bearing cup and bearing cage on pinion shaft (Fig. 87).

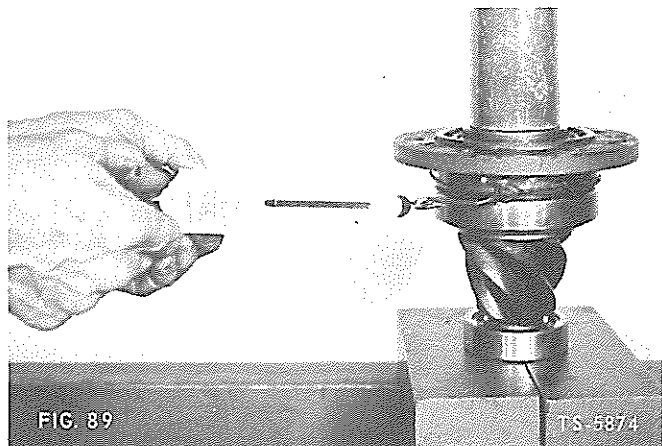


9. Press outer pinion bearing cone on pinion shaft (Fig. 88) using steel tubing for bearing driver. Driver dimensions are shown in Fig. 85.



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.

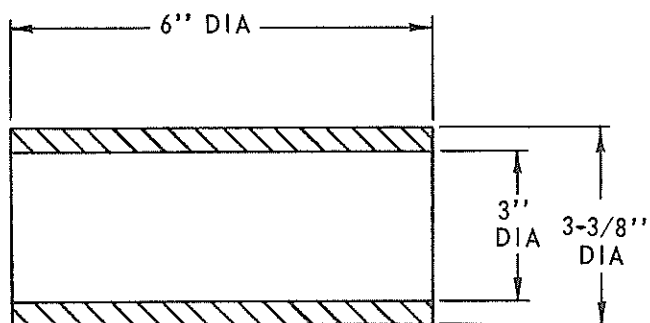
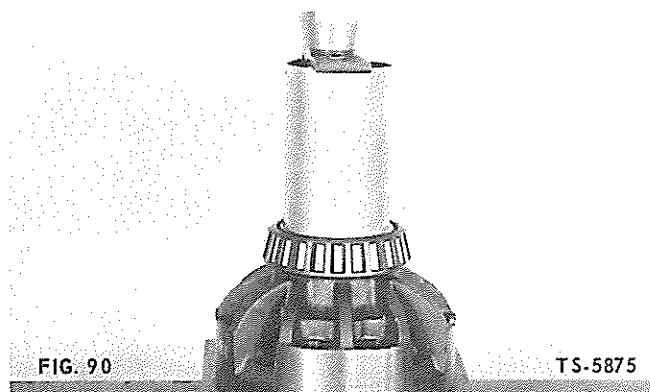




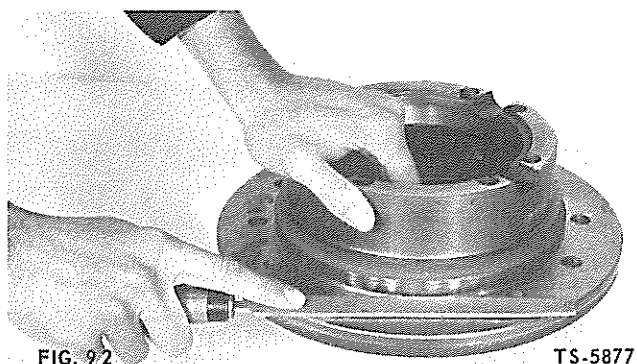
### Reassembly of Differential Ring Gear and Differential Case

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

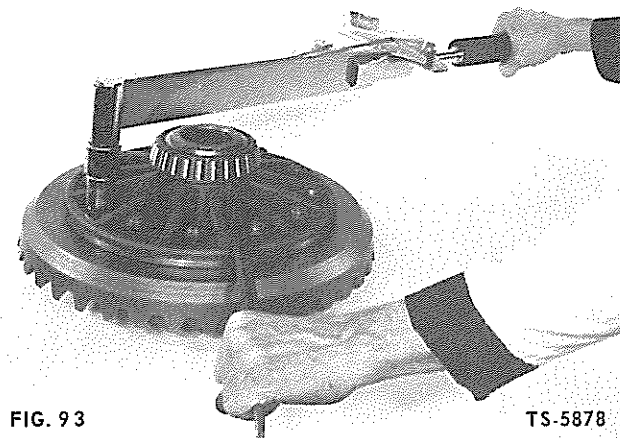
1. Press differential bearing cones on case halves (Fig. 90). Bearing driver dimensions are given in Fig. 91.



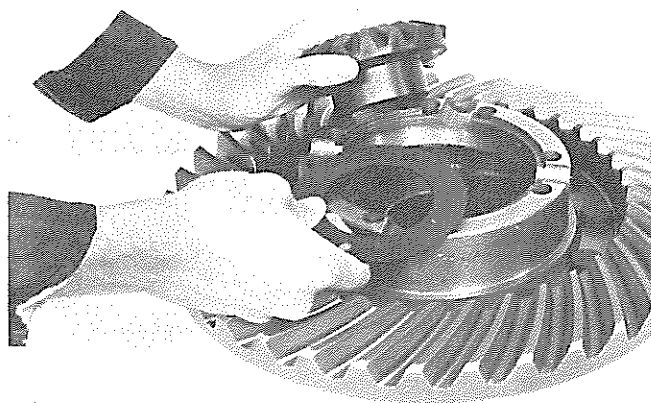
2. Check ring gear mounting surface of flanged half of differential case for burrs. Remove burrs with file (Fig. 92).



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).



4. Lubricate and install thrust washer and side gear in differential case and ring gear assembly (Fig. 94). On axle Part Nos. 130068, 130069, 131078, 131079 and 131599, be sure hole in side gear thrust washer engages dowel projecting from thrust washer bearing surface in differential case half.



- 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). On axle Part Nos. 130068, 130069, 131078, 131079, and 131599, be sure hole in side gear thrust washer engages dowel projecting from thrust washer bearing surface in differential case half.

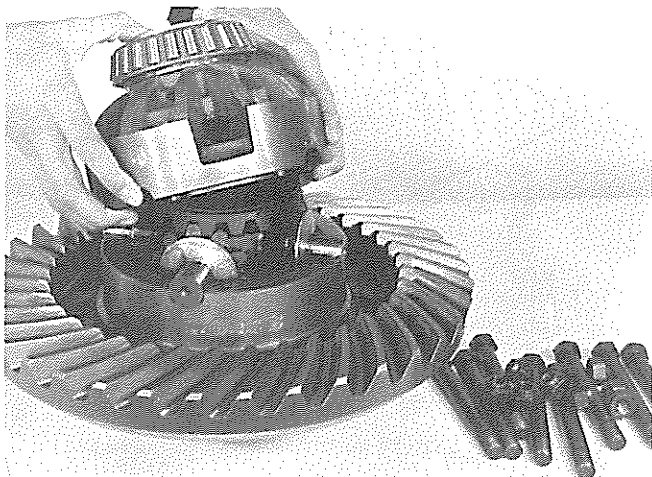


FIG. 95

TS-5852

- 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.

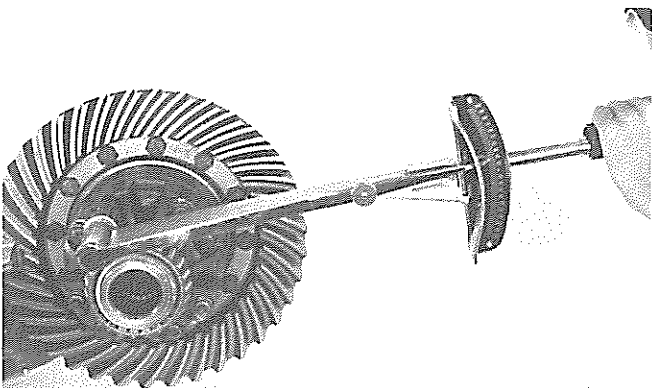


FIG. 96

TS-5880

## Reassembly of Differential and Carrier

- 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.

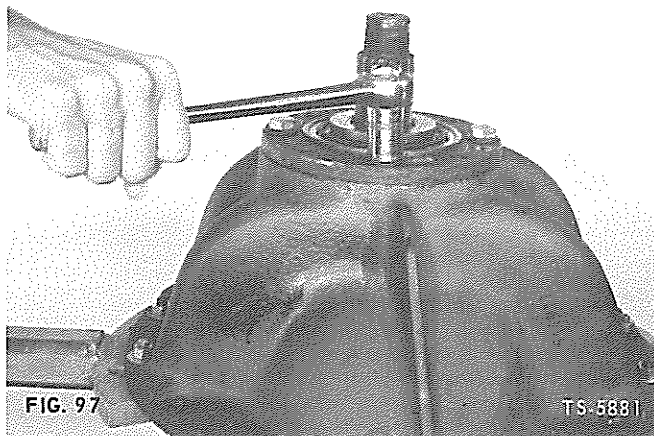


FIG. 97

TS-5881

- 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) as indicated in chart below.

Axle Part No.	Companion Flange Nut Torque
130064	400
130068	600
130069	600
131076	400
131078	500
131079	600
131597	400
131599	500

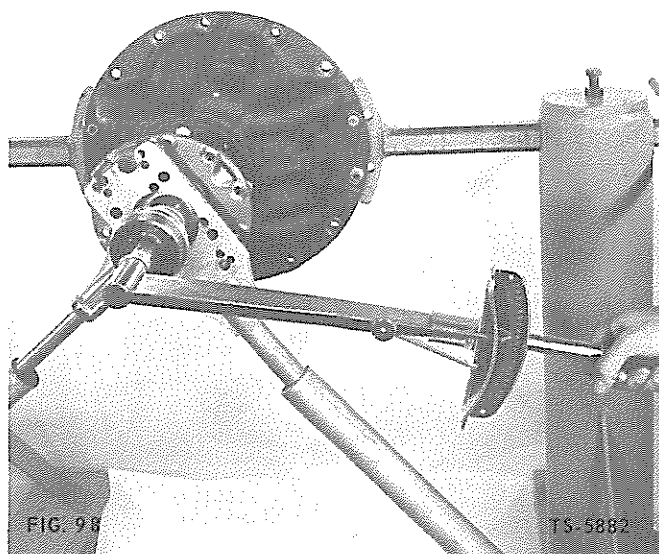
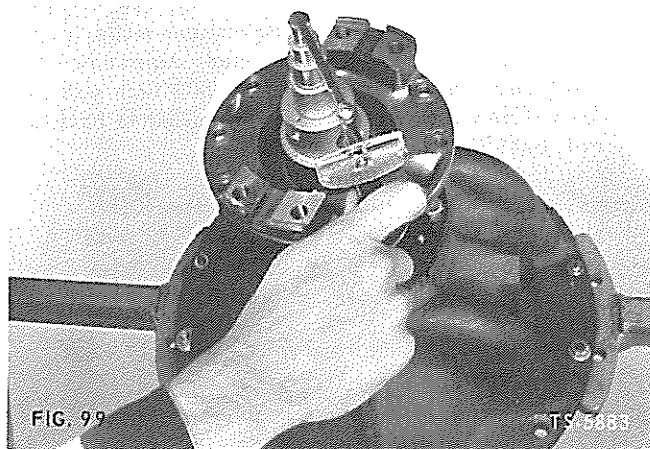


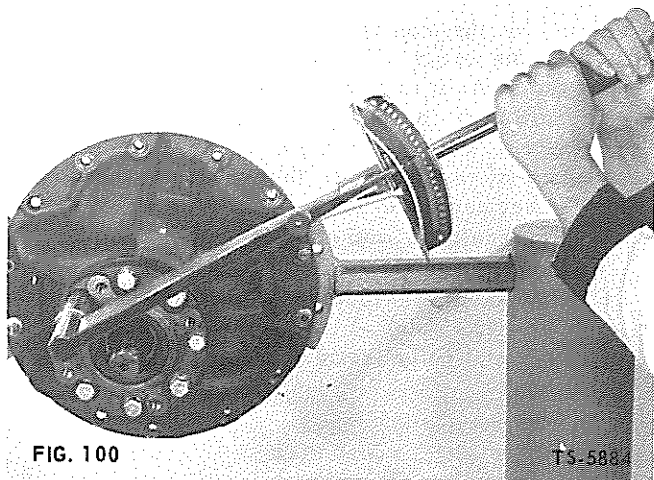
FIG. 98

TS-5882

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.



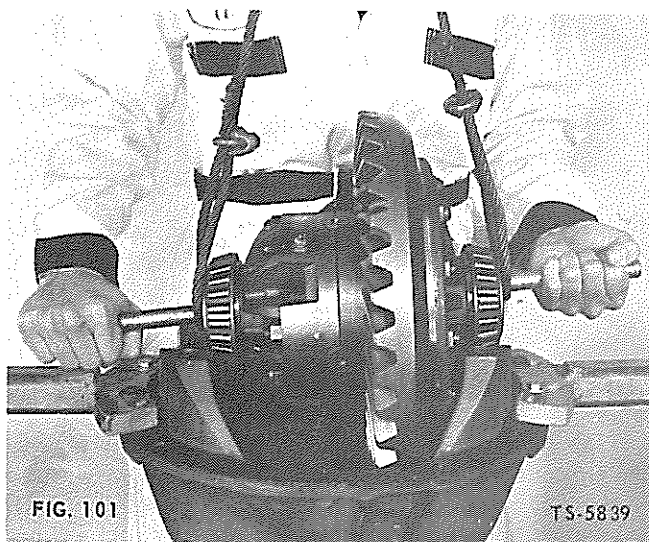
4. Coat outside diameter of seal with Permatex No. 2 and press into pinion oil seal retainer so that lip of seal will face toward pinion. Coat lip with Lubriplate. Install gasket and pinion oil seal retainer. Secure with bolts (Fig. 100), and tighten to torque specifications.



5. Install companion flange on end of pinion shaft with flat washer and nut. Tighten nut as shown in Fig. 98 to torque specifications given in step 2, and secure nut with cotter pin.

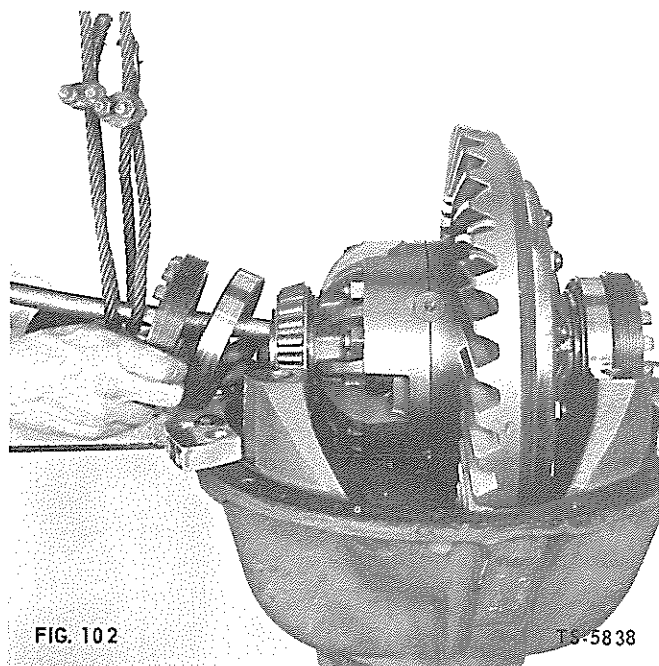
**NOTE:** If axle is equipped with differential mounted parking brake, do not torque nut and install cotter pin at this time. This will be done later when parking brake is installed. Temporarily install companion flange to facilitate hoisting of differential.

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).

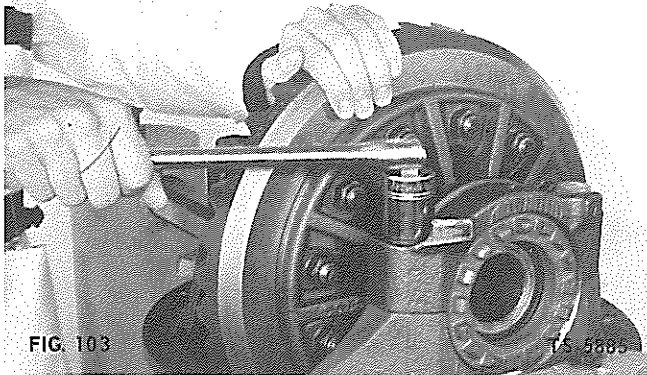


7. Position differential bearing cup and differential adjusting nut on lifting bar on one side of differential and lift bar slightly with hoist. Position bearing cup and adjusting nut in position on carrier (Fig. 102). Repeat procedure and install opposite bearing cup and adjusting nut. Take care to prevent cross-threading of nuts.

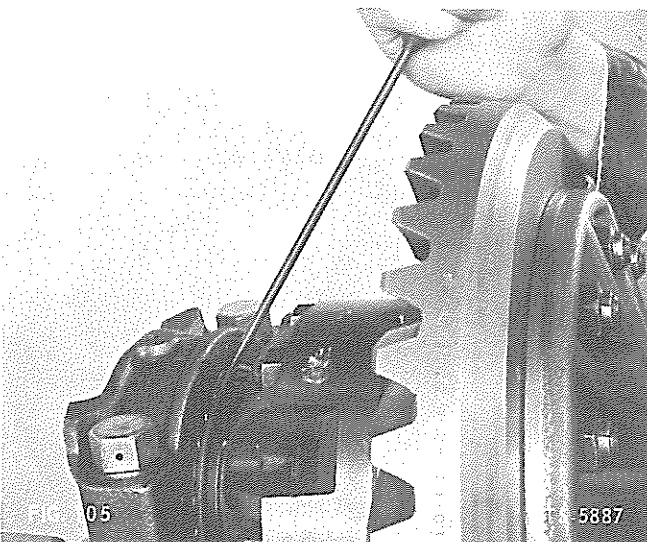
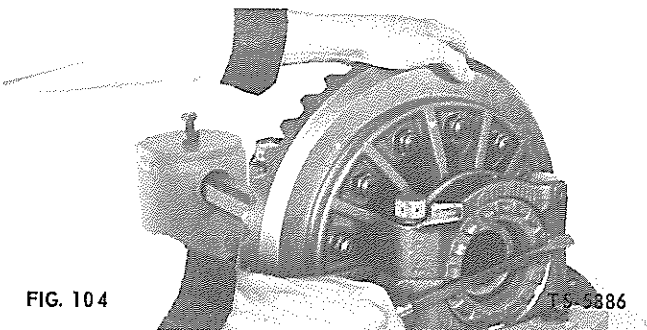
**NOTE:** If differential bearing cones were replaced, new bearing cups must be used.



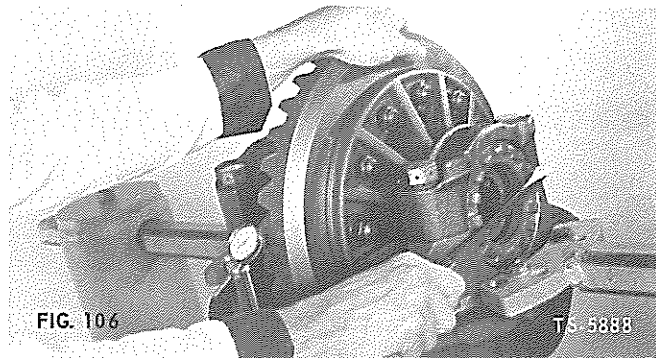
8. Position bearing caps on bearings and nuts, making sure matchmarks made during disassembly are properly aligned. Install bearing cap bolts (Fig. 103) and tighten until snug, but do not fully torque.



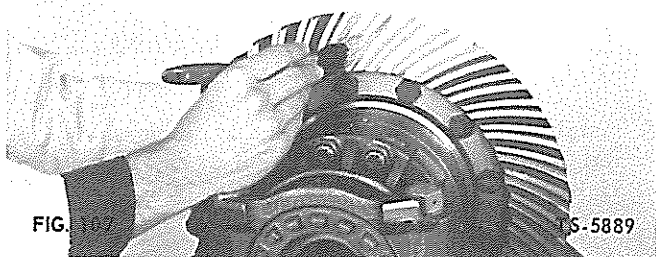
9. Tighten bearing adjusting nuts to adjust bearings to zero end play (Fig. 104). This condition may be checked with screwdriver as shown (Fig. 105). All bearing rollers must rotate as ring gear rotates, but it should not be possible to move bearing rollers sideways in cage when prying against them with screwdriver.



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.

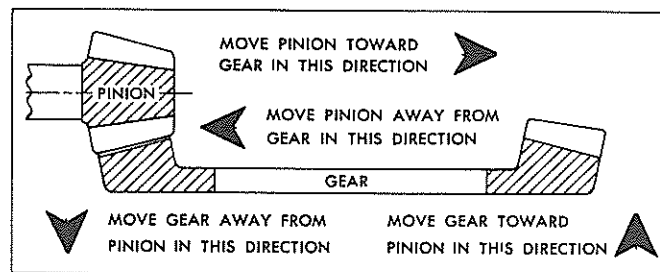
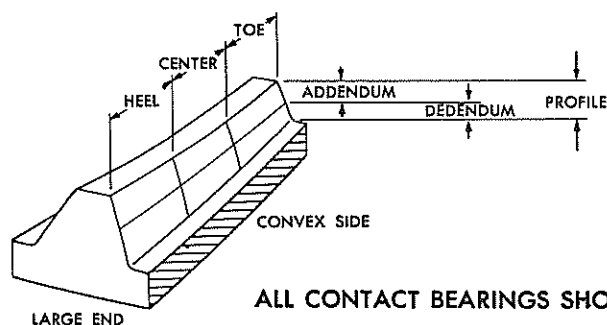


11. Check ring and pinion gear for proper tooth contact. Paint ring gear teeth with a mixture of red lead and linseed oil (Fig. 107). When ring and pinion gears are rotated, the red lead is squeezed away by the contact of the teeth, leaving bare areas the exact size, shape and location of the contacts.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

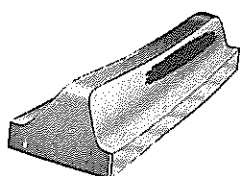


Refer to gear tooth contact chart (Fig. 108). If proper tooth contact pattern is not as shown, re-adjust backlash or add or remove pinion bearing cage shims as necessary. Split shims are provided

# SPIRAL BEVEL AND HYPOID TOOTH BEARING CONTACT CHART

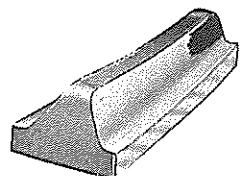
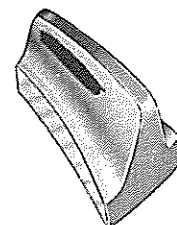


ALL CONTACT BEARINGS SHOWN BELOW ARE ON RIGHT HAND SPIRAL RING GEAR — THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.



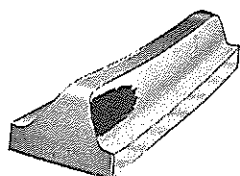
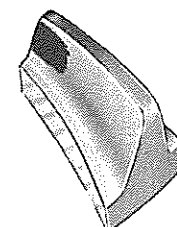
## CONDITION 1

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



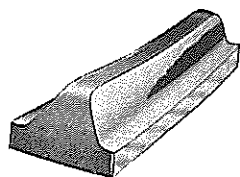
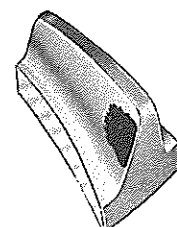
## CONDITION 2

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.



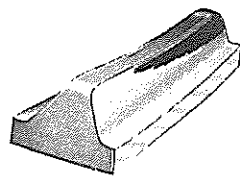
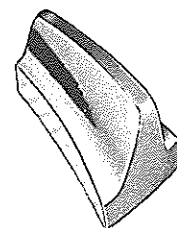
## CONDITION 3

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.



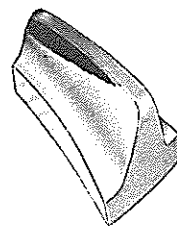
## CONDITION 4

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.

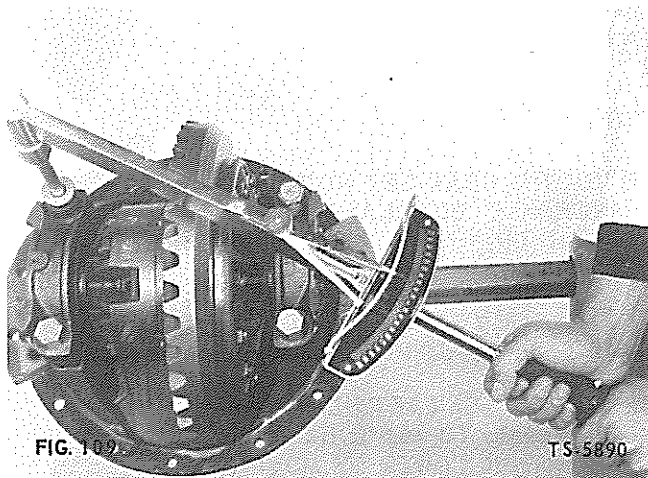
FIG. 108

TS-5574

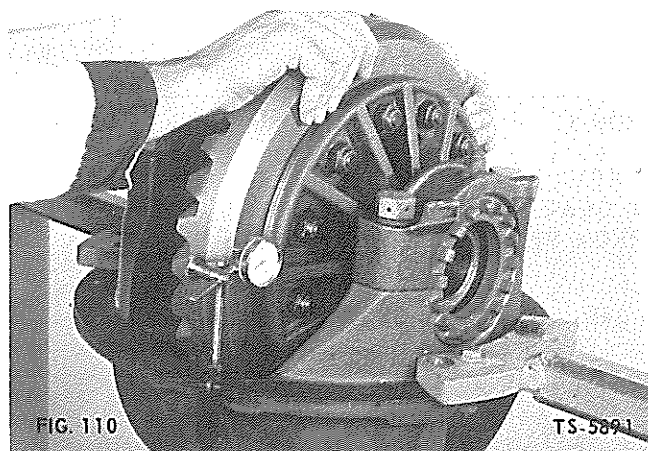


to permit removal or insertion between bearing cage and differential housing. Mark seal retainer flange, bearing cage flange and differential housing to identify relative position of parts. Remove retainer bolts and rotate seal retainer until two holes, diametrically opposite, line up with puller bolt 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.

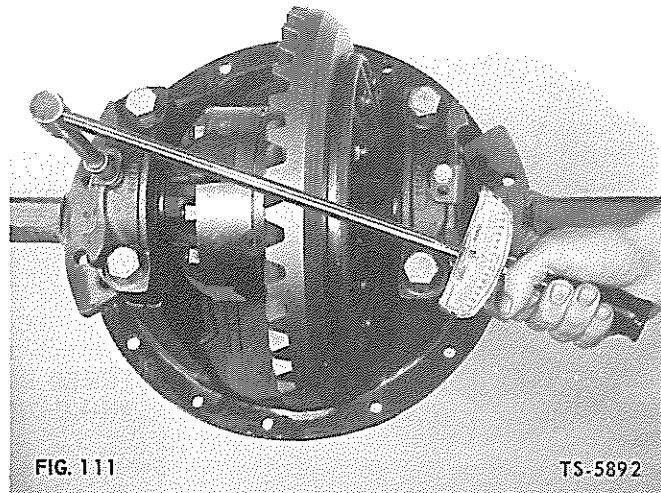
12. Tighten bearing cap bolts (Fig. 109) per torque specifications. With dial indicator, recheck ring gear and pinion backlash. Recheck differential bearings for end play as described in step 9.



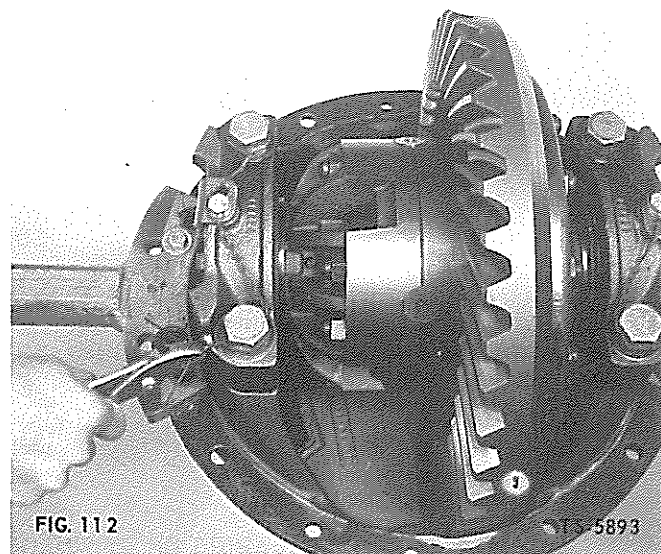
13. Use dial indicator to check back face of ring gear. Rotate at least one full turn (Fig. 110). Runout must not exceed .005 inch total indicator reading. If runout is excessive, remove assembly and check for burrs or dirt under mounting surface of ring gear. Reassemble and recheck.



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



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

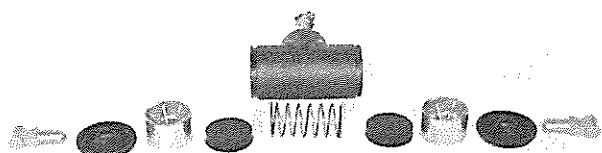


FIG. 113

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).

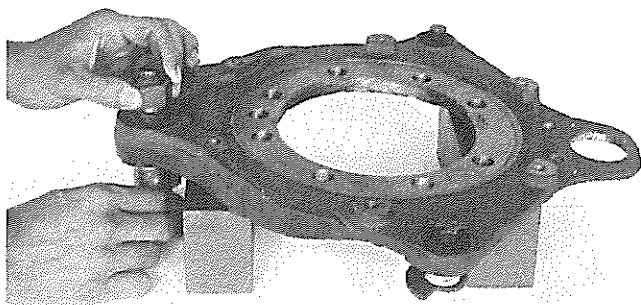


FIG. 114

TS-5894

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

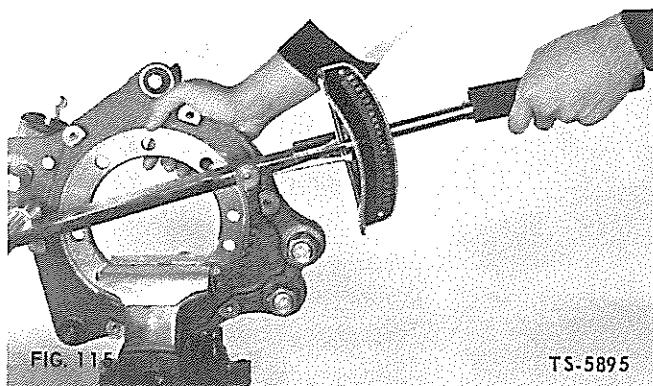


FIG. 115

TS-5895

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

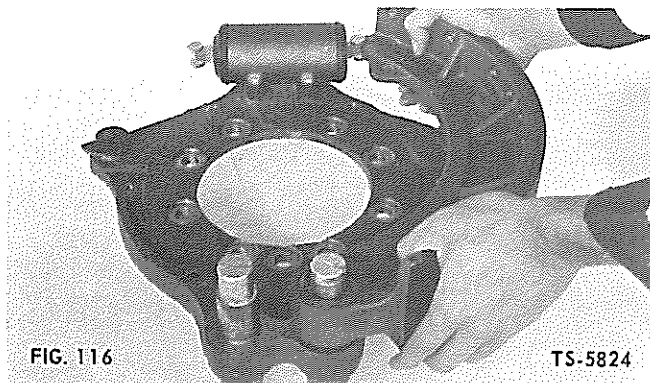


FIG. 116

TS-5824

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

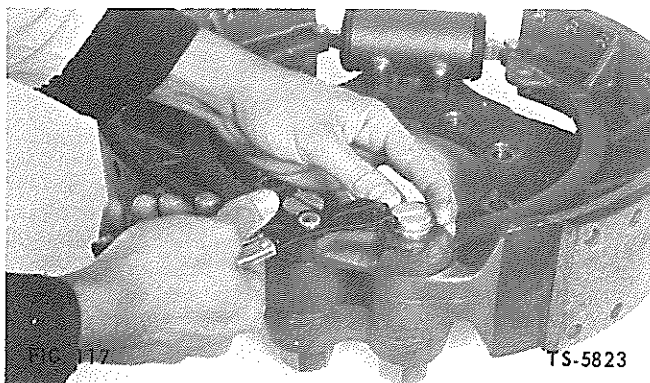


FIG. 117

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).

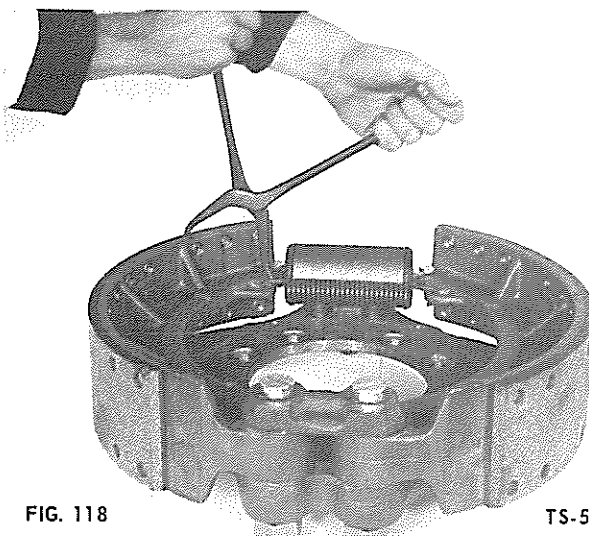


FIG. 118

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.

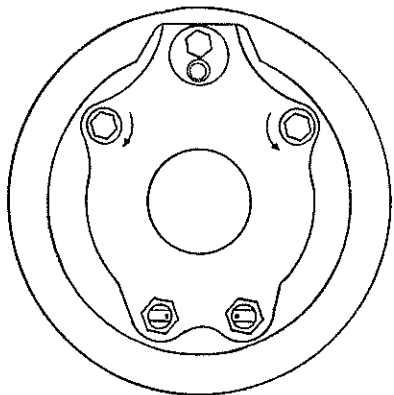


FIG. 119

TS-5896

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).

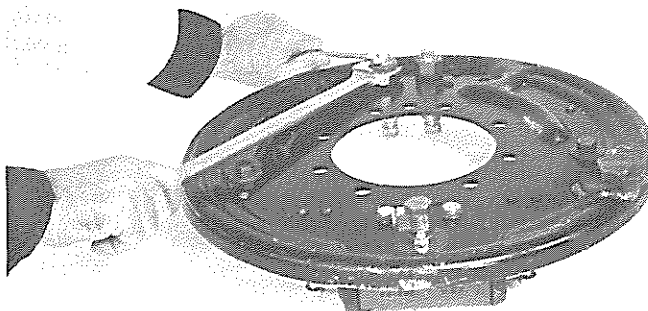


FIG. 121

TS-5833

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

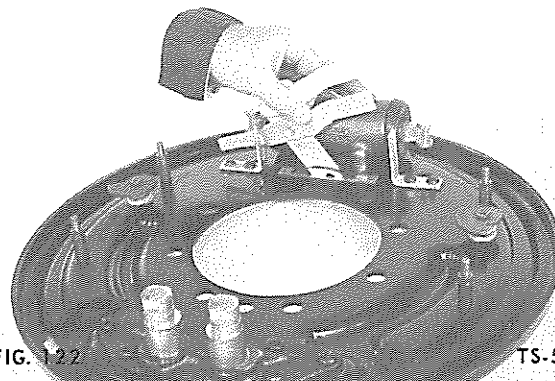


FIG. 122

TS-5832

## 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).

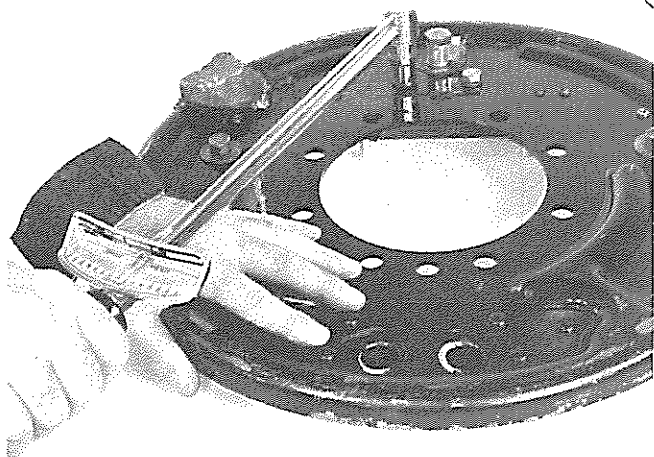


FIG. 120

TS-5897

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).

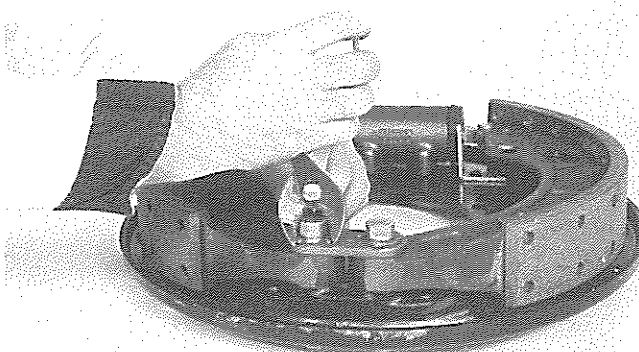


FIG. 123

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.

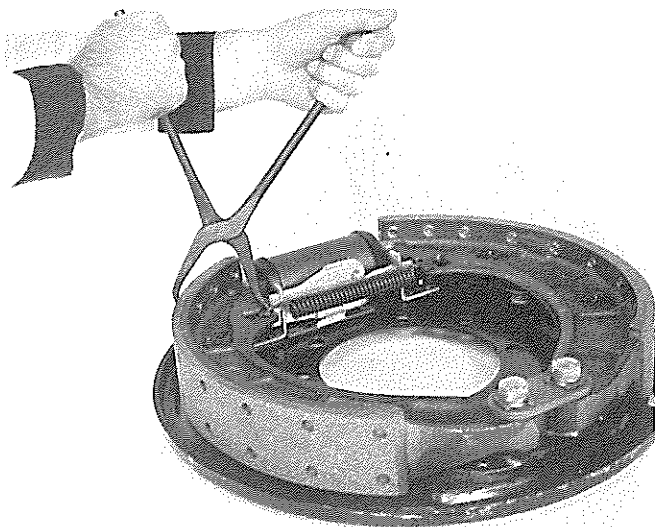


FIG. 124

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.

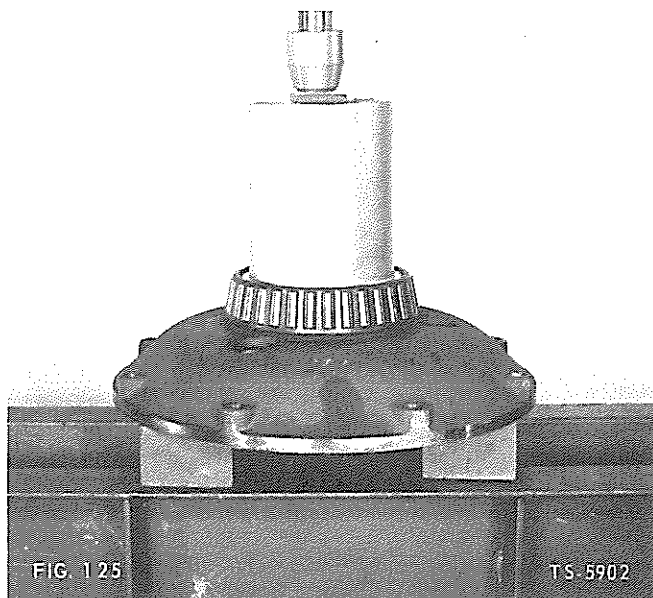


FIG. 125

TS-5902

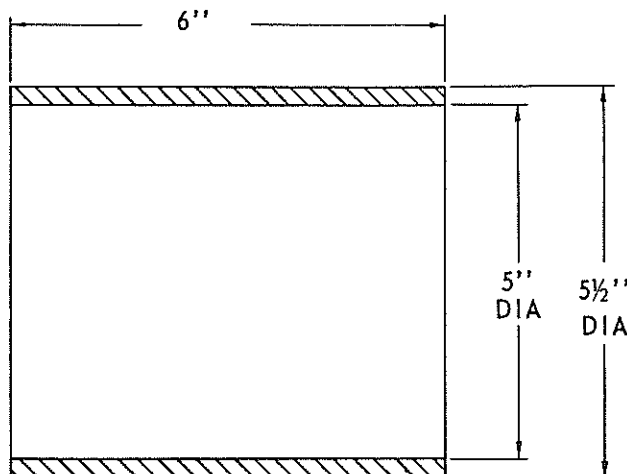


FIG. 126

TS-5903

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

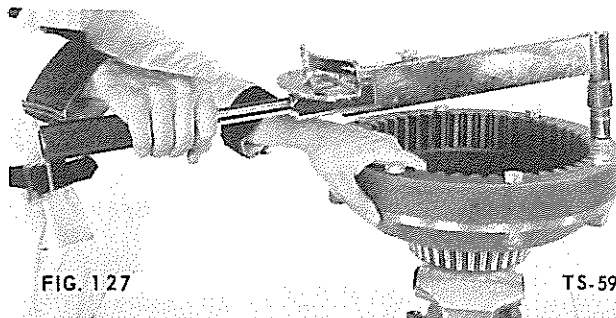


FIG. 127

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.

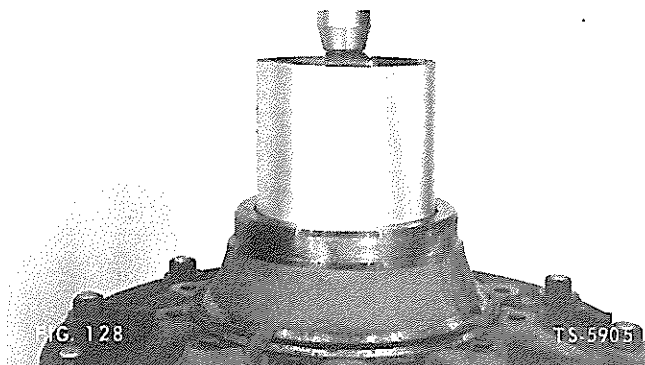


FIG. 128

TS-5905

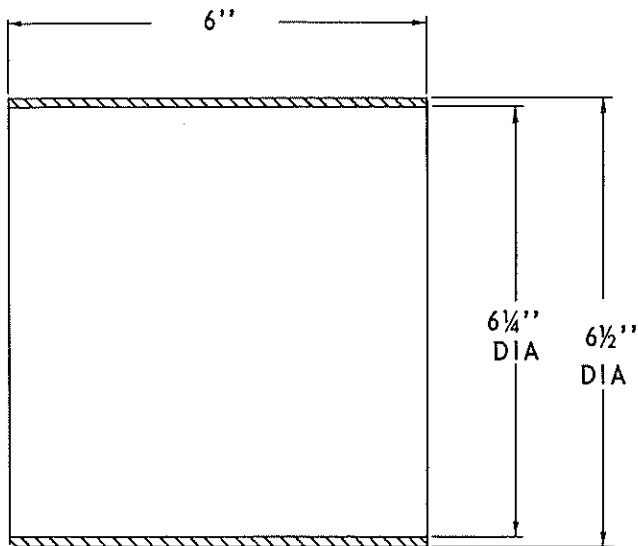


FIG. 129

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.

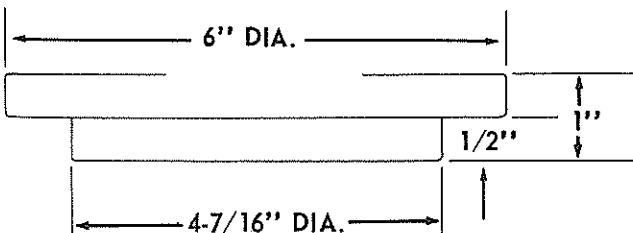
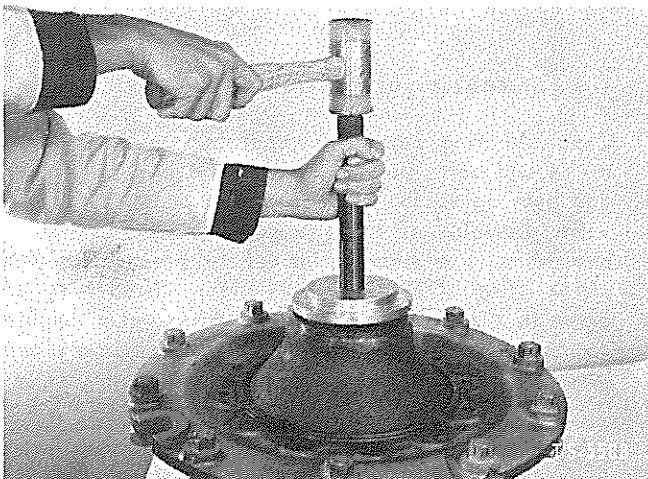


FIG. 131

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

TS-5815

## 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).

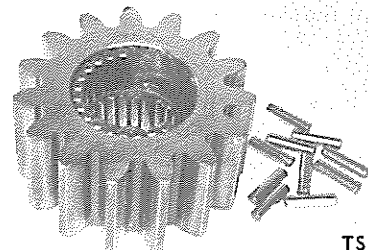


FIG. 133

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).

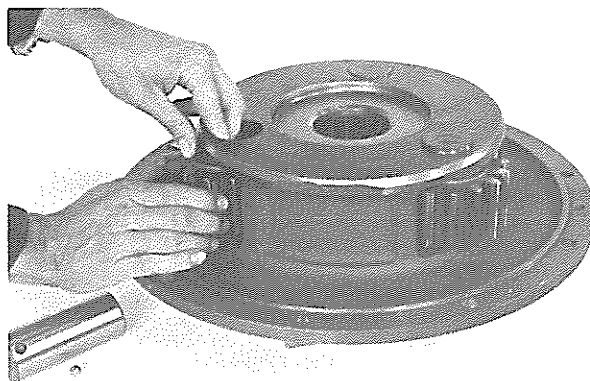
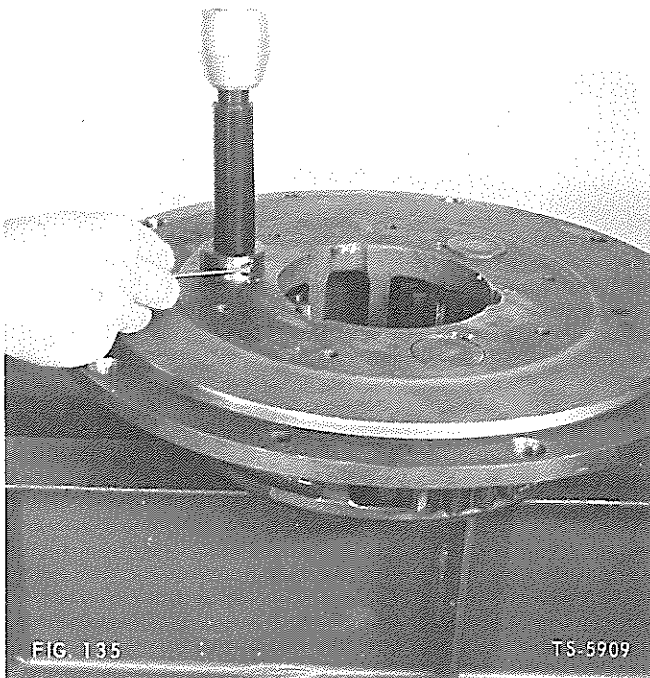


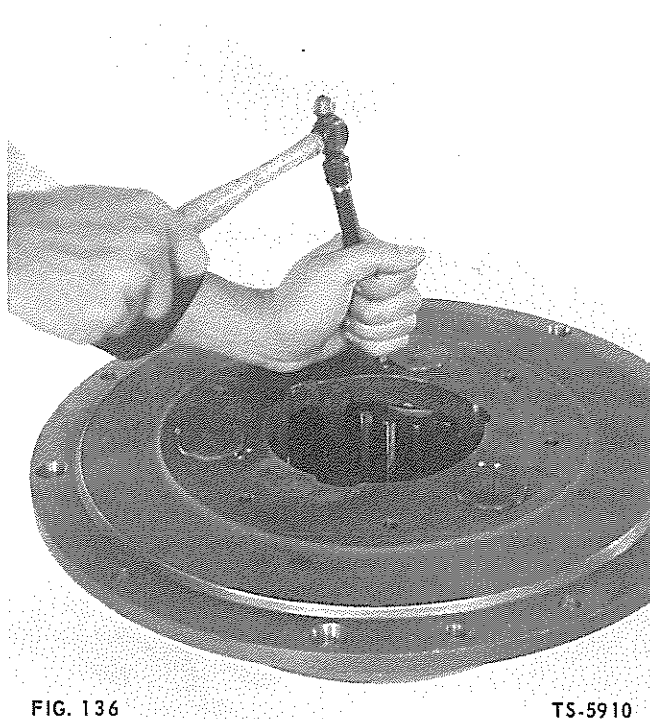
FIG. 134

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.



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

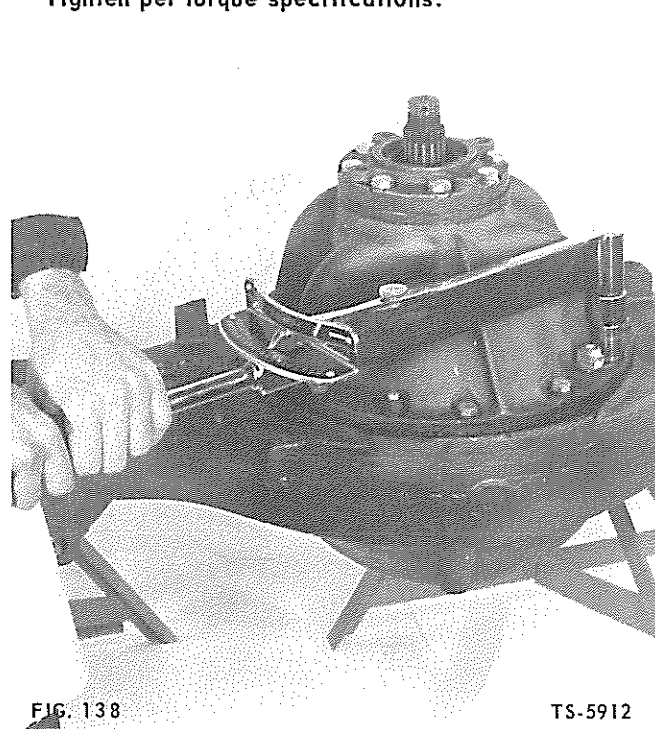


### Reassembly of Axle Parts

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).



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

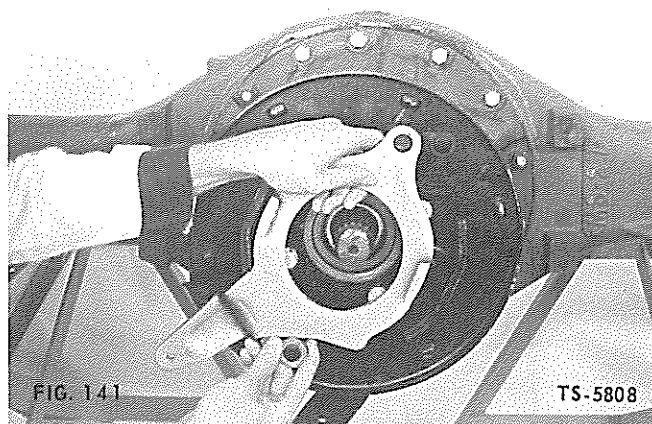


- On axles equipped with parking brakes, remove companion flange that was temporarily installed during differential reassembly. Position parking brake backing plate on pinion oil seal retainer of differential; secure with bolts and lockwashers (Fig. 139). Tighten to torque specifications.

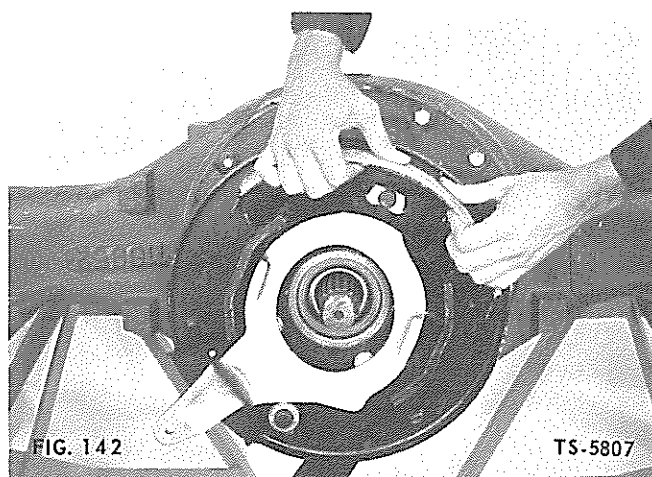
**NOTE:** Parking brake backing plate positions vary for different axles. Refer to Fig. 140 and the following chart for the various backing plate positions. Note that Fig. 140 shows backing plate in inverted position to coincide with reassembly photographs.

Axle Part No.	Fig. 140 Position
131076	B
131078	A
131079	C
131597	B
131599	A

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



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



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

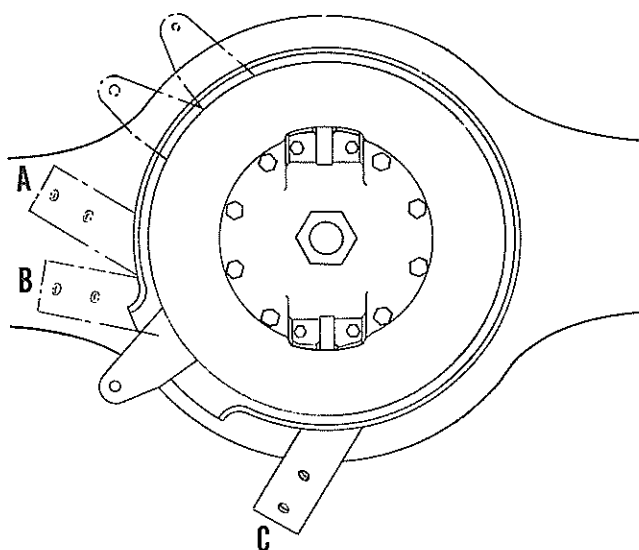
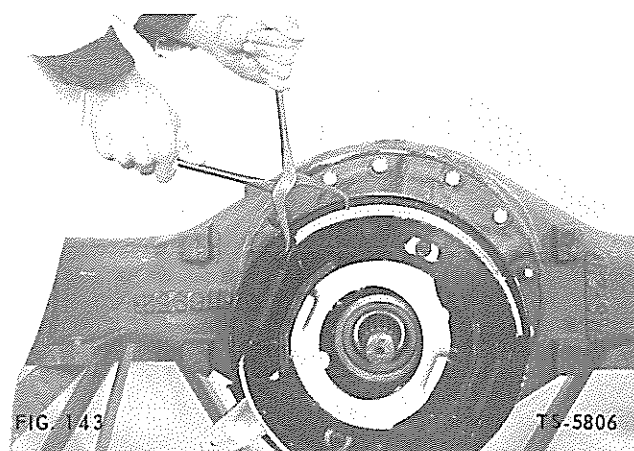


FIG. 140

TS-5914

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

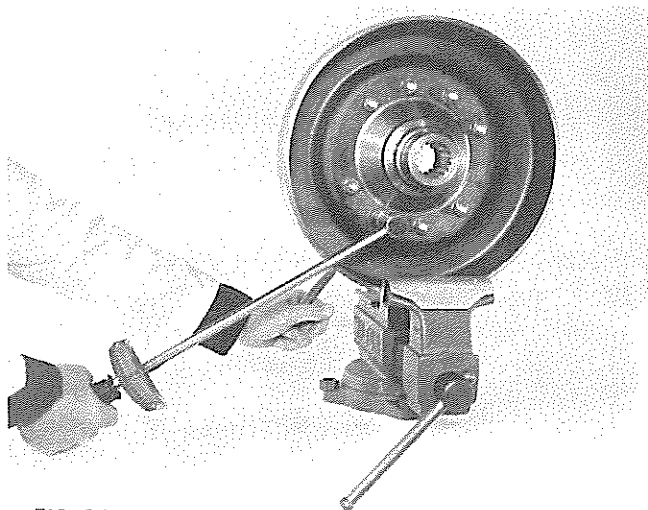


FIG. 144

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 charted below. Install cotter pin to retain nut to shaft.

Axle Part No.	Companion Flange Nut Torque
130064	400
130068	600
130069	600
131076	400
131078	500
131079	600
131597	400
131599	500

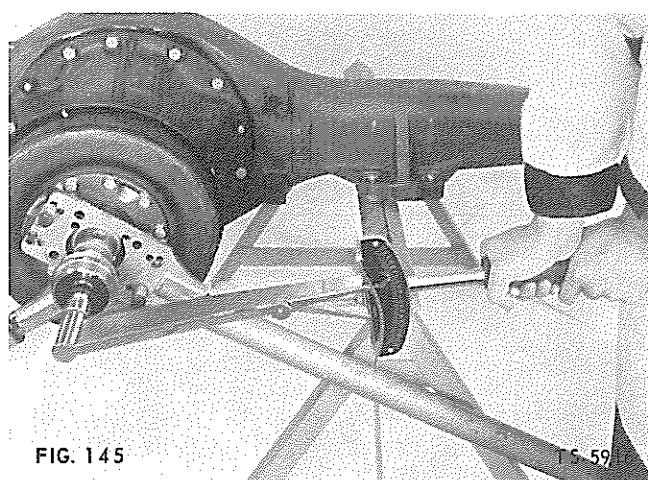


FIG. 145

TS-59

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.

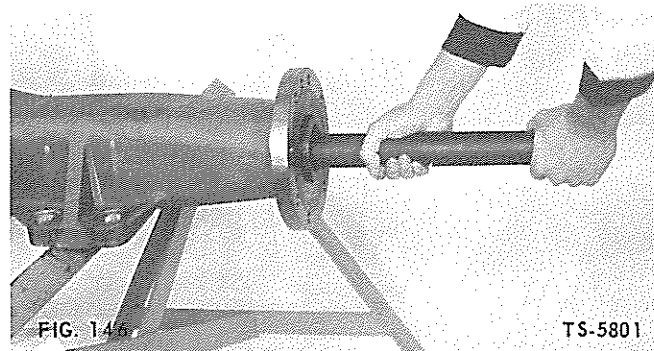


FIG. 146

TS-5801

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

NOTE: On axle Part Nos. 130064, 131076, and 131597, spindles are integral with axle housings so that step 10 is omitted.

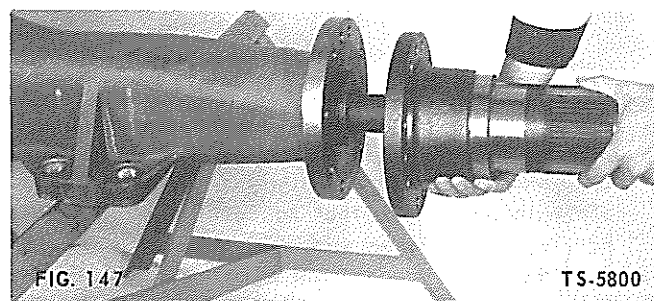


FIG. 147

TS-5800

11. Position brake assembly on spindle or on axle housing 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.

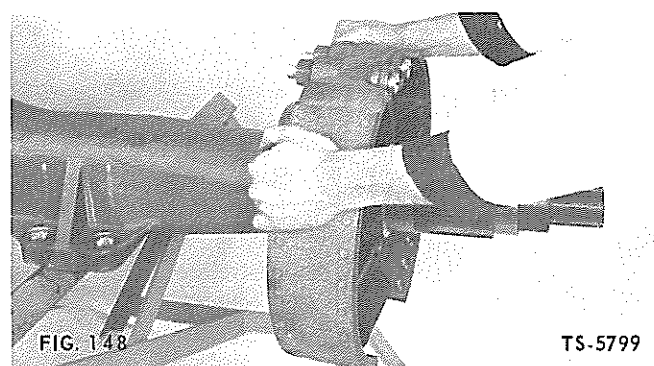
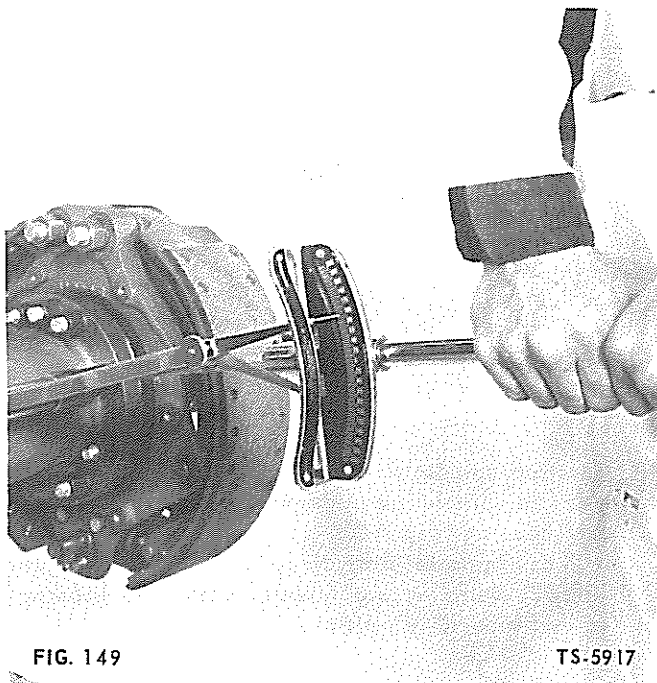


FIG. 148

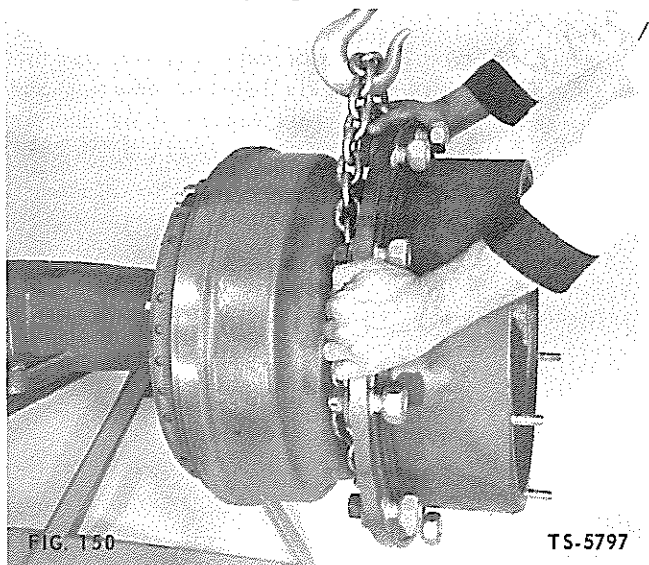
TS-5799



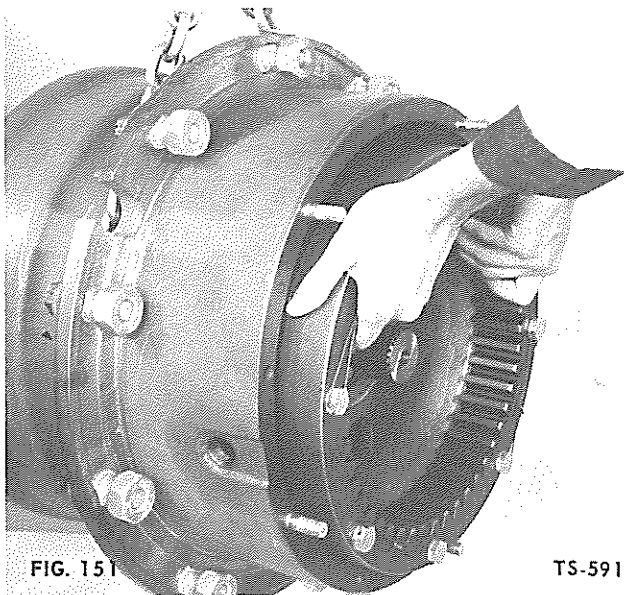
12. Secure brake assembly and spindle (if separate) to axle housing with bolts, nuts, and flat washers (Fig. 149). Tighten per torque specifications.



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.

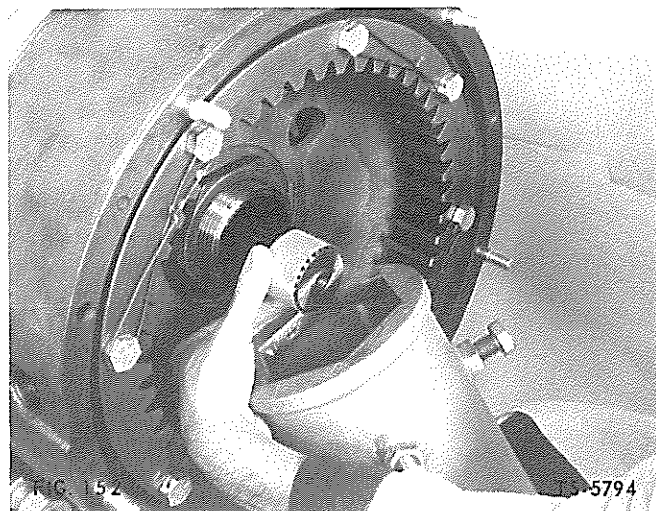


14. Continue to support hub and drum with hoist. Position internal gear and hub on axle so that it engages splines on spindle (Fig. 151).



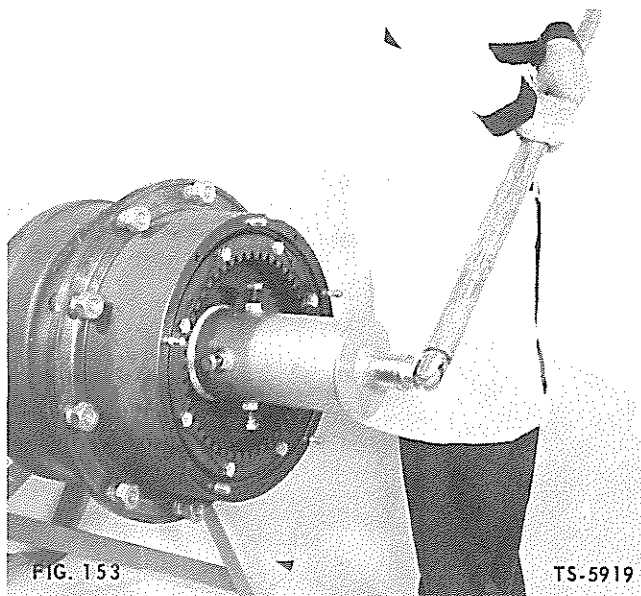
15. Install inner nut on spindle. Wrap several turns of .010 inch to .020 inch shim stock around splines of axle shaft to protect splines. Install spindle nut socket wrench (Clark Part No. 945940) on nut (Fig. 152) and tighten guide bolts lightly against axle shaft.

**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.

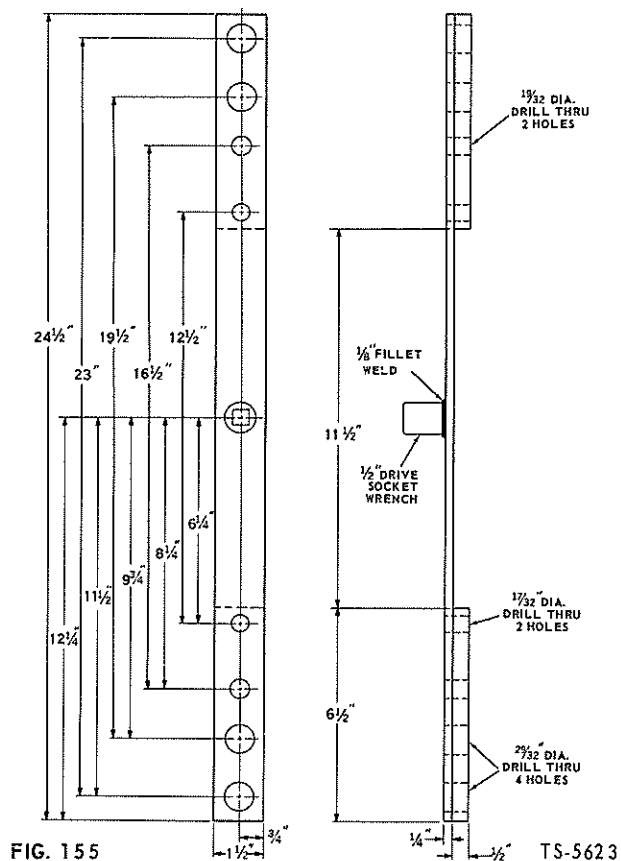
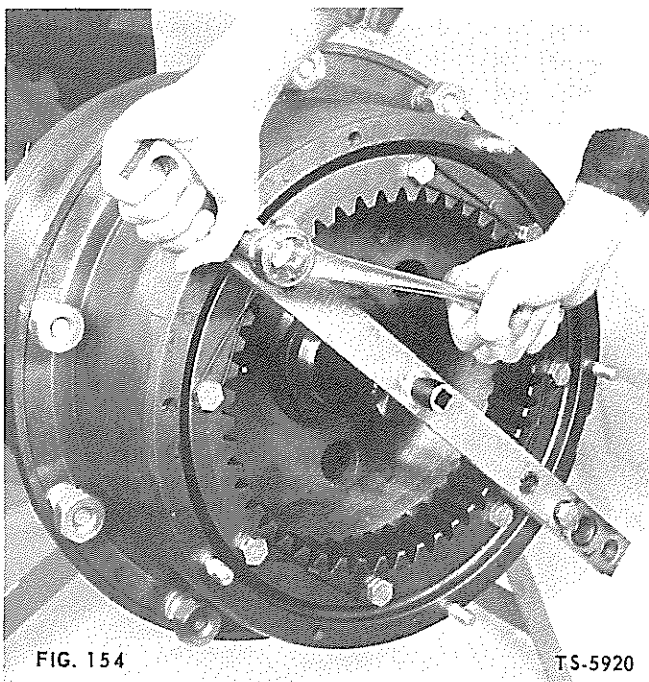


**First (Preferred) Method:**

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

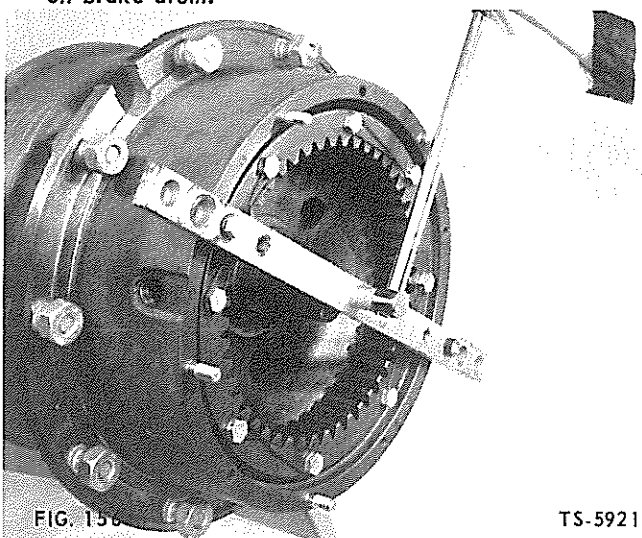


17. Install torque wrench adapter bar, as shown in Fig. 154, using a stud and one 1/2-13 x 1-1/2 inch bolt. The adapter bar can be fabricated locally to specifications outlined in Fig. 155. Bar illustrated will accommodate wheel hubs with planetary bolt circle diameters of 12-1/2, 16-1/2, 19-1/2, and 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 15 and 20 ft. lbs. On used bearings rotating torque should be between 6 and 12 ft. lbs.

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



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:

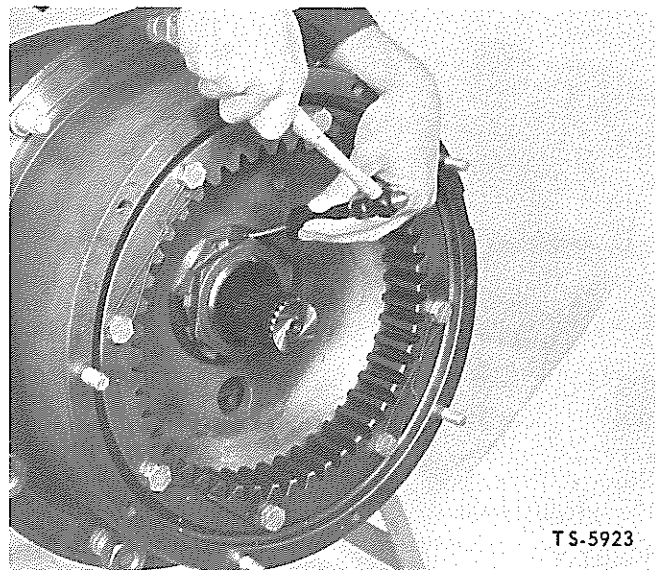
20. Attach heavy string or cord to one of wheel studs on hub and wrap cord around wheel hub several times, attaching pound pull scale to end of cord as shown in Fig. 157. Tighten inner nut until rotating torque measured on pull scale is within specifications given in chart below.

Axle Part No.	Rotational Pull (lbs.)	
	New Bearings	Old Bearings
130064	27 - 35	11 - 21
130068	21 - 28	9 - 17
130069	21 - 28	9 - 17
131076	27 - 35	11 - 21
131078	27 - 35	11 - 21
131079	21 - 28	9 - 17
131597	27 - 35	11 - 21
131599	27 - 35	11 - 21

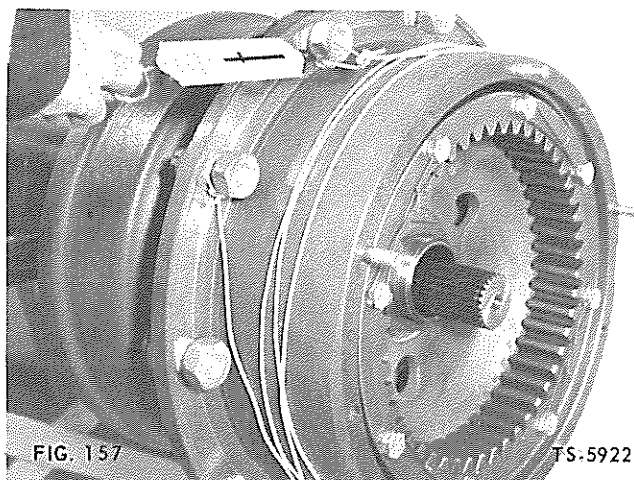
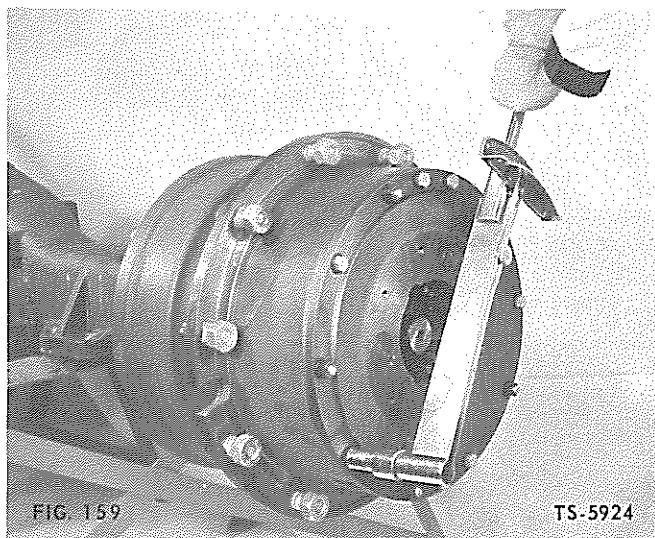
**NOTE:** Bearing preload rotating torque using a pound pull scale is figured by multiplying the radius (distance from center of wheel to outside diameter of wheel hub) by the reading on the pull scale and dividing by 12 to arrive at ft. lbs. of torque. For example: Wheel hub radius of 8-3/4 inches times 24 lbs. (reading on pull scale) equals 210 in. lbs. Dividing by 12 equals approximately 17 ft. lbs., which is within specification of 15 to 20 ft. lbs. rotating torque for new bearings.

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).

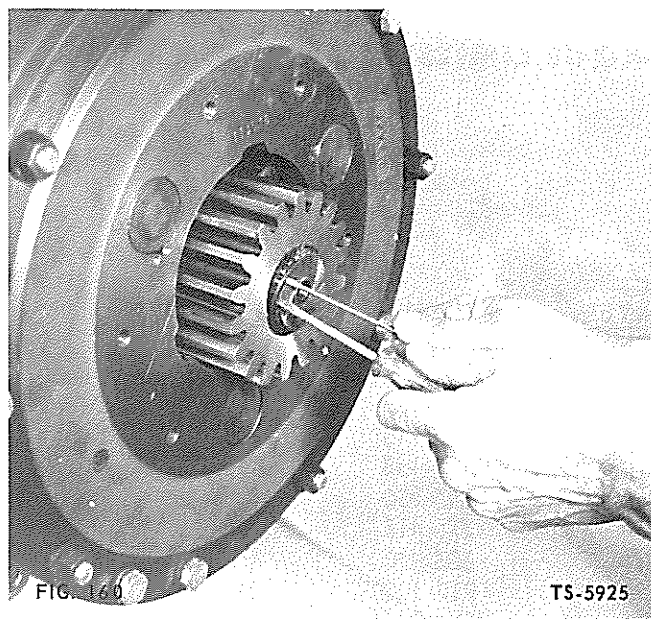


23. Apply a light coating of Permatex No. 2 to mounting flange of the planet spider assembly except for axle Part No. 130068 which uses a gasket between spider and hub. Install planet spider on hub with bolts, nuts, dowels and lockwashers (Fig. 159), except for axle Part No. 130068 which uses only bolts and washers. Tighten to torque specifications.

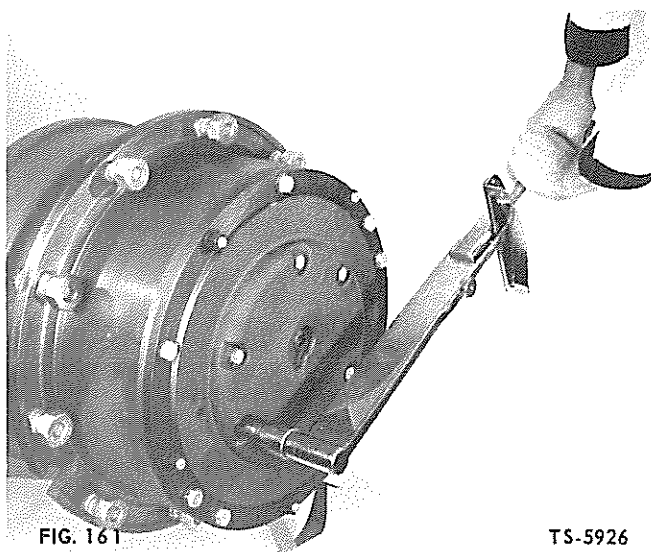




24. Slide axle out of differential and housing approximately 4 inches and position sun gear on axle shaft. Secure with sun gear retaining ring (Fig. 160). Reinstall axle shaft in differential and housing.



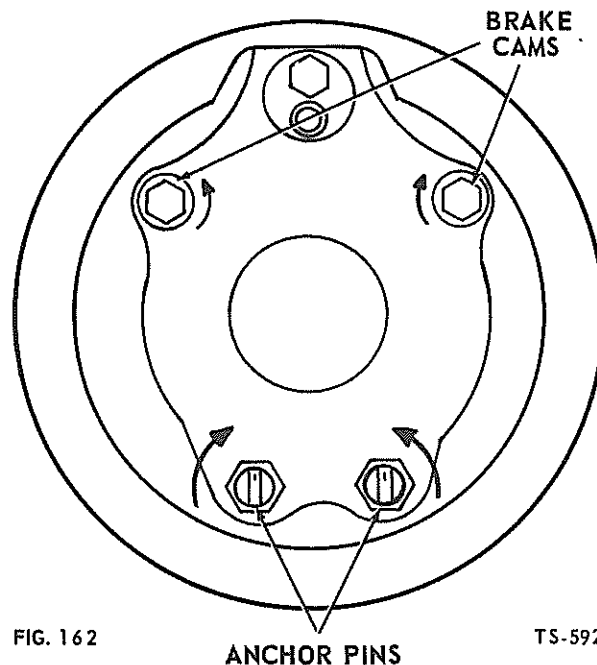
25. Install "O" ring seal in groove in sun gear thrust cap for axle Part Nos. 131076, 131078, 131079, 131597, and 131599. Apply light coating of Permatex No. 2 to mounting face of the sun gear thrust cap on axle Part Nos. 130064, 130068 and 130069. Install cap on planetary spider assembly. Make certain 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).



## 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.



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 indicated in the following chart, making sure anchor pin does not rotate while tightening.

Axle Part No.	Anchor Pin Nut Torque
130064	110 - 125
130068	110 - 125
130069	110 - 125
131076	145 - 155
131078	145 - 155
131079	145 - 155
131597	145 - 155
131599	145 - 155

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**

<u>COARSE THREADS</u>	<u>DRY</u>	<u>LUBRICATED OR PLATED</u>	<u>DRY</u>	<u>LUBRICATED OR PLATED</u>
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

NOTES

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