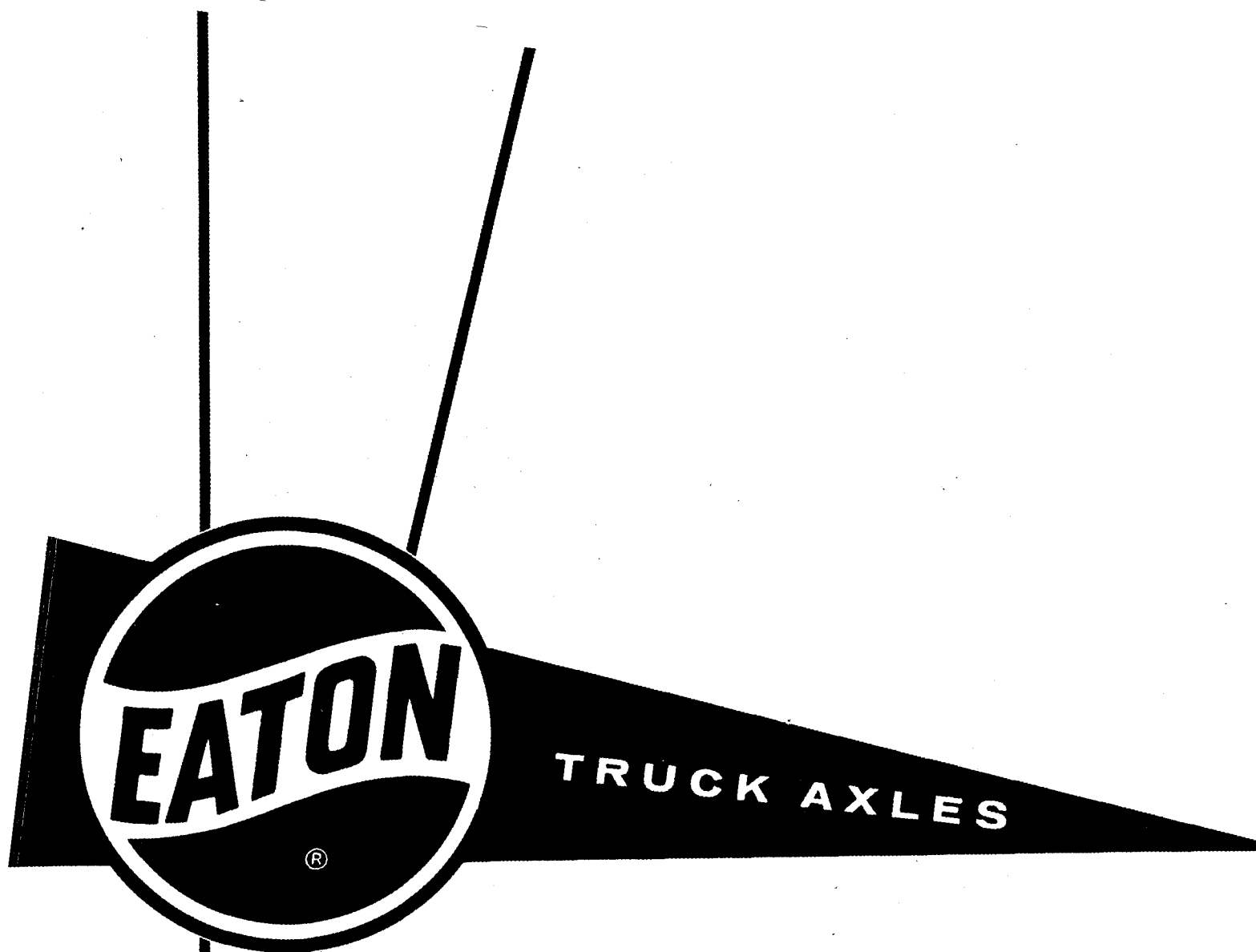




service
manual

EATON MANUFACTURING COMPANY

Axle Division

FOREWORD

Eaton Manufacturing Company presents this Service Manual to aid the service man in the service and maintenance of Eaton Truck Axles. Instructions given are recommended procedures to eliminate unnecessary effort and to obtain the longest life from your Eaton Axle.

Each axle section contains illustrations to visually present disassembly and reassembly procedures and correct relationship between the various components of the axles.

Inspection and Failure Analysis, Adjustments, and Lubrication recommendations are contained in separate sections of the manual. Torque requirements for tightening attaching parts are tabulated in an individual section.

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Cleveland, Ohio



service and maintenance instructions for Eaton Truck Axles

index

This manual is divided into major sections covering various axles, as listed in the Table of Contents. These sections are also indexed by page number and title with thumb index tabs, as shown to the right.

To use this manual, grasp the right-hand side of book between thumb and fingers. Bend book back and find the page containing related thumb index tab.

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Identification of Eaton Rear Axles

The following is included to define nomenclature and model identification used in this manual.

Single Reduction Axle. Rear axle assembly with single reduction through ring gear and drive pinion.

Planetary Double Reduction Axle. Rear axle assembly with two reductions; one through ring gear and drive pinion, one through planetary gearing.

2-Speed Axle. Rear axle assembly with two ratios that can be changed at vehicle operator's option.

Double Reduction Axle. Rear axle assembly with two reductions; one through ring gear and drive pinion, one through herringbone pinion and gears.

Tandem Drive Axle. Rear axle assembly incorporating two individual axle units and power divider inter-connected by a propeller shaft. The power divider (mounted on forward rear axle) is used to distribute

power and to provide inter-axle differentiation to the forward and rear axle units.

Forward Rear Axle. Forward unit of a tandem drive axle.

Rear Rear Axle. Rear unit of a tandem drive axle.

Lockout. Mechanism which controls operation of inter-axle differential in Tandem Drive Axles. Three types are available: (*Air-operated*) — cab-mounted air valve control of air cylinder. (*Vacuum-operated*) — cab-mounted mechanical control of vacuum cylinder. (*Mechanically-operated*) — cab-mounted control through mechanical linkage.

Axle Shift System. System to control movement of shift fork and sliding clutch gear which, in turn, changes axle ratio. (*Air-Torsion Spring Shift System*) — electric switch, solenoid valve and air-pressure chamber controls operation. (*Electric Shift System*) — electric switch controls electric motor and torsion spring drive operation.

Nomenclature System for "D" Series Tandem Drive Axles						
"D" Series Tandem Drive Axles	AIR BRAKES		HYDRAULIC BRAKES		BRAKES (not furnished)	
	Forward Rear Axles	Rear Rear Axles	Forward Rear Axles	Rear Rear Axles	Forward Rear Axles	Rear Rear Axles
Single Reduction	DSA	RSA	DSH	RSH	DS	RS
2-Speed	DTA	RTA	DTH	RTH	DT	RT
Planetary Double Reduction	DPA	RPA	DPH	RPH	DP	RP
3-Speed	D-3A	R-3A	D-3H	R-3H	D-3	R-3

D — Forward rear axle with inter-axle differential

S — Single reduction

T — 2-Speed

P — Planetary double reduction

R — Rear rear axle

A — Air brakes

H — Hydraulic brakes

3 — 3-Speed

30, 34, etc. — preceding letters signify various rated load capacities of the tandem on the ground.

Nomenclature System for "M" Series Tandem Drive Axles						
"M" Series Tandem Drive Axles	AIR BRAKES		HYDRAULIC BRAKES		BRAKES (not furnished)	
	Forward Rear Axles	Rear Rear Axles	Forward Rear Axles	Rear Rear Axles	Forward Rear Axles	Rear Rear Axles
22M, 28M, 32M, 36M and 50M	MFA	MRA	MFH	MRH	MF	MR

M — "M" series tandem drive axle

F — Forward rear axle

R — Rear rear axle

A — Air brakes

H — Hydraulic brakes

22, 28, etc. — preceding letters signify various models within the basic series.

single reduction axles

► DESCRIPTION AND OPERATION

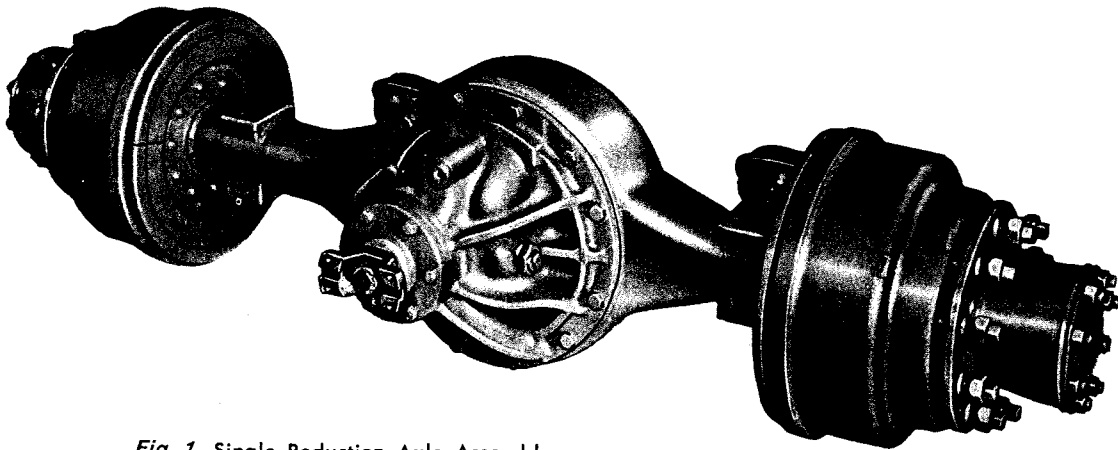


Fig. 1. Single Reduction Axle Assembly

The Eaton Single Reduction Axle consists of a full-floating, banjo-type axle housing and a single-speed differential carrier. Power flow is through a matched ring gear and drive pinion, and a differential unit to the axle shafts and wheels. Ring gear and drive pinion may be of the hypoid or spiral bevel type.

This axle is used in two basic applications; either as an individual unit functioning as a single-speed rear axle, or as the rear rear unit of a tandem drive axle. (Refer to "D" and "M" Series Tandem Drive Axle Sections of this manual.)

The following service instructions are applicable to all Eaton Single Reduction Axles. Depending upon application, slight variations exist between the various axle models. These variations occur in use of ring gear thrust blocks, pinion bearing spacer washers, oil distributor, ring gear attaching parts, differential case attaching parts and companion flange flat washers. Parts usage in each individual axle will become apparent as the unit is disassembled for service. The general disassembly and reassembly procedures outlined herein are not affected by the above mentioned variations.

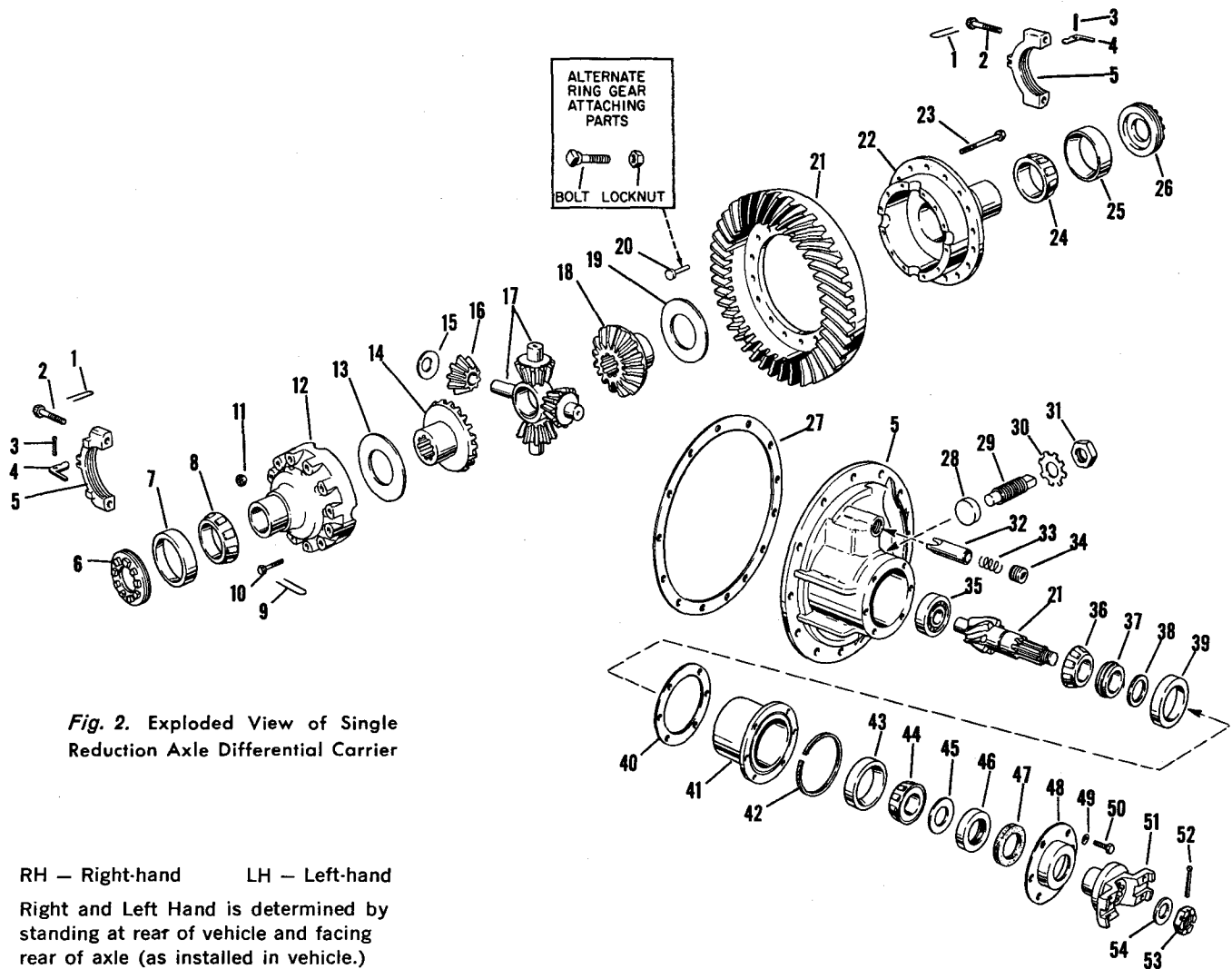


Fig. 2. Exploded View of Single Reduction Axle Differential Carrier

RH — Right-hand LH — Left-hand

Right and Left Hand is determined by standing at rear of vehicle and facing rear of axle (as installed in vehicle.)

1. Lockwire
2. Cap screw
3. Cotter pin
4. Adjuster lock
5. Differential carrier and bearing caps (matched parts)
6. Differential bearing adjuster (RH)
7. Differential bearing cup (RH)
8. Differential bearing cone (RH)
9. Lockwire
10. Cap screw
11. Nut
12. Differential case (plain half)
13. Side gear thrust washer (RH)
14. Side gear (RH)
15. Side pinion thrust washer
16. Side pinion
17. Spider

18. Side gear (LH)
19. Side gear thrust washer (LH)
20. Rivet
21. Ring gear and drive pinion (matched set)
22. Differential case (flanged half)
23. Bolt
24. Differential bearing cone (LH)
25. Differential bearing cup (LH)
26. Differential bearing adjuster (LH)
27. Carrier gasket
28. Ring gear thrust block
29. Adjusting screw
30. Lock
31. Locknut
32. Oil distributor
33. Spring
34. Pipe plug
35. Pinion pilot bearing

36. Pinion bearing cone (inner)
37. Pinion bearing spacer
38. Pinion bearing spacer washer
39. Pinion bearing cup (inner)
40. Pinion bearing cage shims
41. Pinion bearing cage
42. Cork seal
43. Pinion bearing cup (outer)
44. Pinion bearing cone (outer)
45. Companion flange flat washer
46. Oil seal
47. Felt seal
48. Oil seal retainer
49. Lockwasher
50. Cap screw
51. Companion flange
52. Cotter pin
53. Pinion nut
54. Flat washer

► OVERHAUL

► disassembly of differential carrier

remove differential carrier from axle housing

1. Drain lubricant. Disconnect propeller shaft and remove axle shafts.

2. Remove differential carrier to axle housing cap screws or stud nuts. Lift out differential carrier assembly. Discard carrier gasket.

disassemble differential carrier

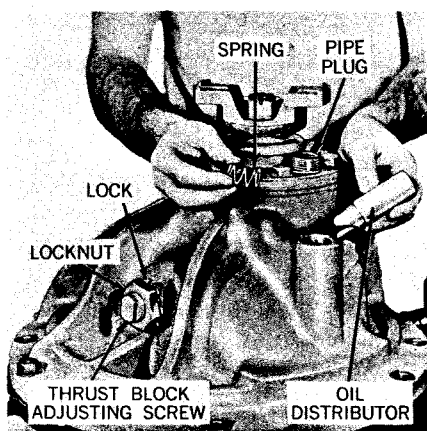


Fig. 3

1. Unscrew pipe plug, then remove spring and oil distributor. (Oil distributors are not used on all axles)

2. Straighten ear of lock then loosen locknut and adjusting screw. Remove ring gear thrust block from end of adjusting screw. (Thrust blocks are not used on all axles)

3. Punch mark differential bearing caps and carrier for correct location in reassembly. Also punch mark differential bearing adjusters for correct location of adjuster locks.

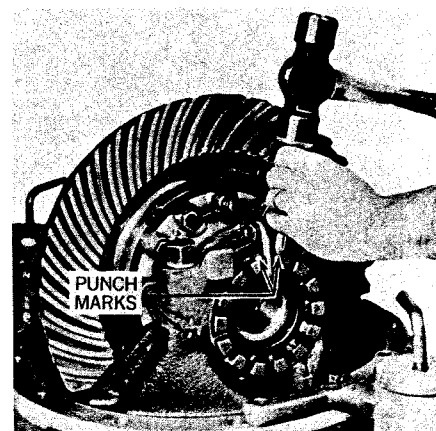


Fig. 4

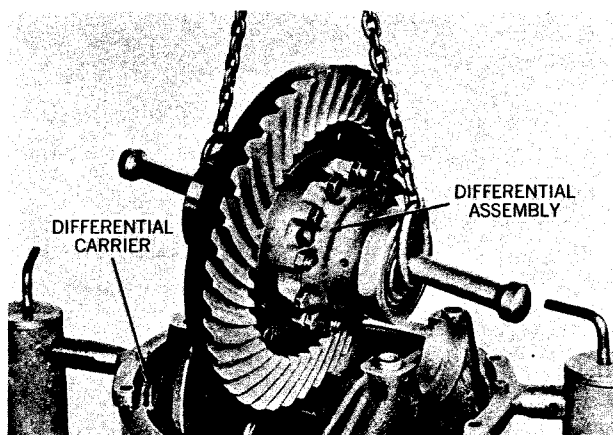


Fig. 5

If preliminary inspection reveals that ring gear and drive pinion are satisfactory, check backlash and tooth pattern for easier adjustment in reassembly.

4. Cut lockwires, then remove cap screws, differential bearing caps and adjusters. Tilt ring gear away from pinion and lift out differential assembly.

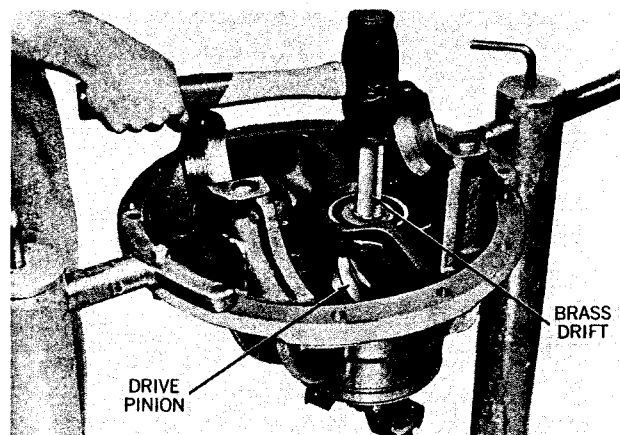


Fig. 6

5. Remove pinion bearing cage to carrier cap screws. Drive pinion assembly out of carrier, being careful not to allow assembly to fall on flange. Note size and quantity of shims under bearing cage flange for easier adjustment during reassembly.

disassemble drive pinion

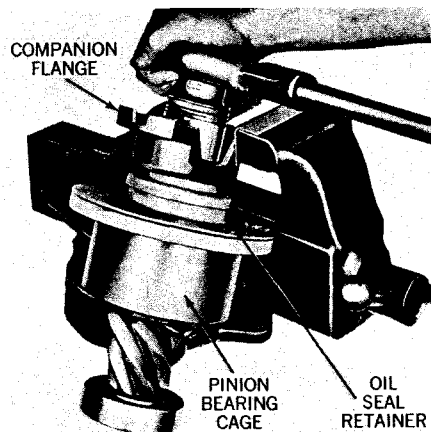


Fig. 7.

1. Hold companion flange in vise, then remove cotter pin, nut and flat washer. Drive pinion out of flange.

2. With flange removed from drive pinion, remove pinion bearing cage assembly. Remove oil seal retainer, flange flat washer (if used) and outer bearing cone from pinion bearing cage. Discard bearing cage cork seal.

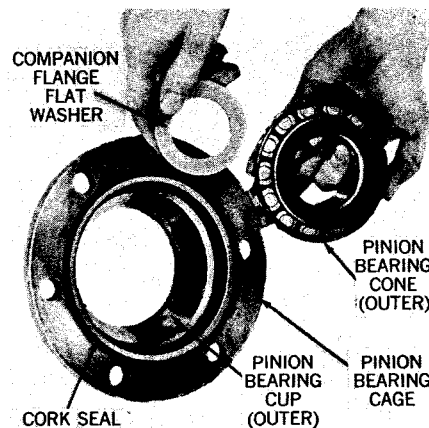


Fig. 8.

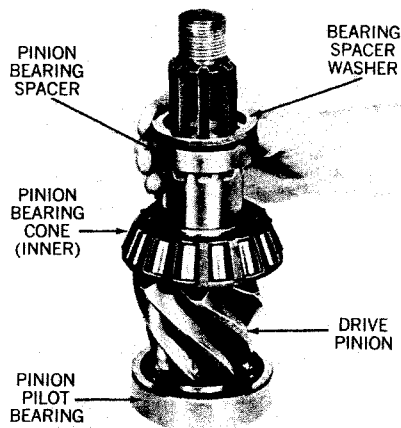


Fig. 9.

3. If replacement is necessary, remove bearing cups from cage, using suitable puller. Remove oil seal and felt seal from oil seal retainer.

4. Remove bearing spacer washer (if used) and spacer from drive pinion.

5. Remove inner bearing cone and pilot bearing from drive pinion, using suitable pullers.

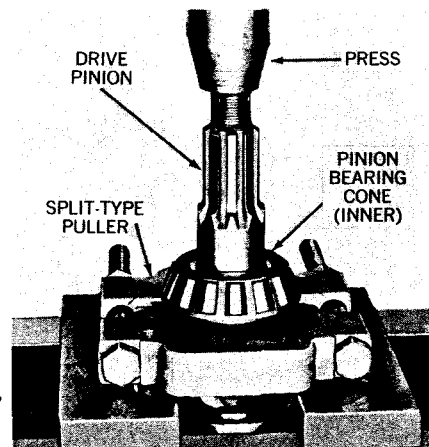


Fig. 10.

disassemble differential

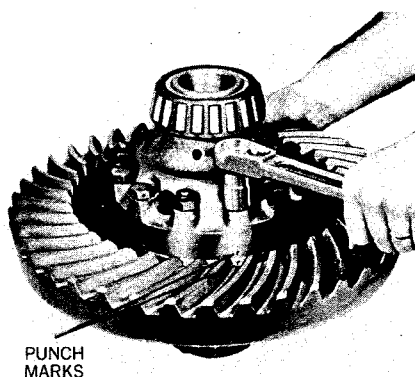


Fig. 11.

1. Punch mark differential cases for correct location in reassembly. Cut lockwire, then remove cap screws, nuts and bolts. Lift off plain differential case.

2. Remove right-hand side gear and thrust washer, then lift out differential spider, side pinion and thrust washer assembly. Remove left-hand side gear and thrust washer from flanged differential case.

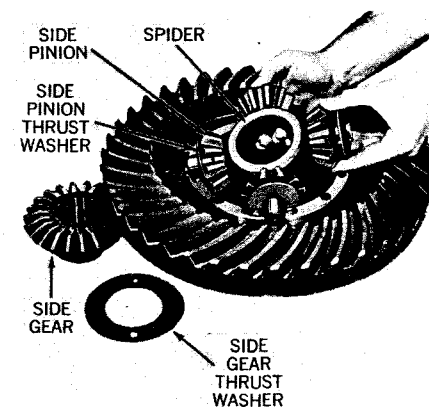


Fig. 12.

disassemble differential (continued)

3. Remove bearing cones from differential cases with a split-type puller.

4. To remove ring gear from flanged differential case, drill off the flat head (on ring gear side) of rivets and drive out rivets. Some ring gears are attached to flanged differential case with locknuts and bolts.

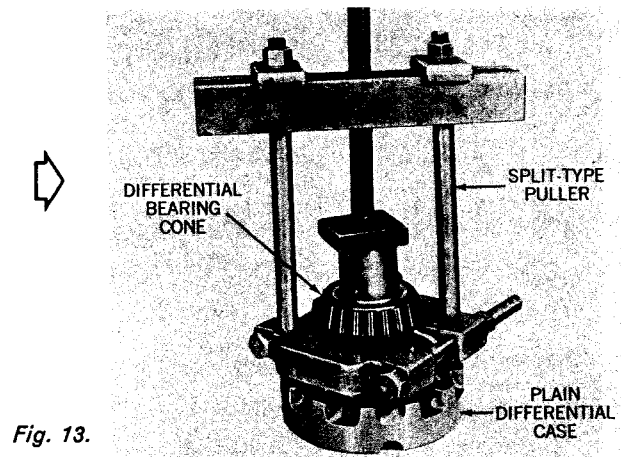


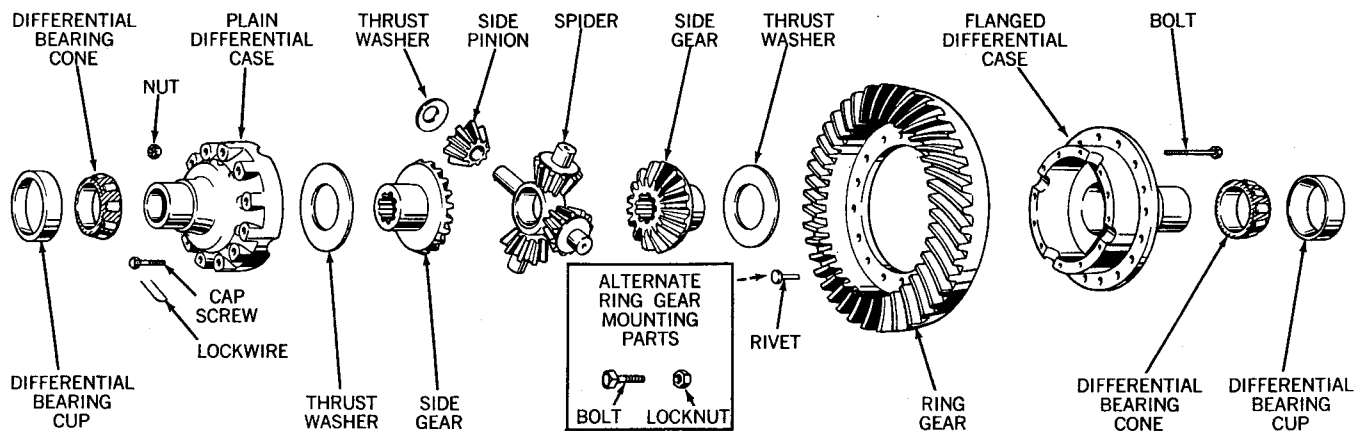
Fig. 13.

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.

► reassembly of differential carrier

For Torque Requirements . . . refer to page 117.



NOTE: Bolts and locknuts are available for service replacement on all axles except 22MF, 28MF, 32MF, 22MR, 28MR.

Fig. 14. Exploded View of Differential

assemble differential

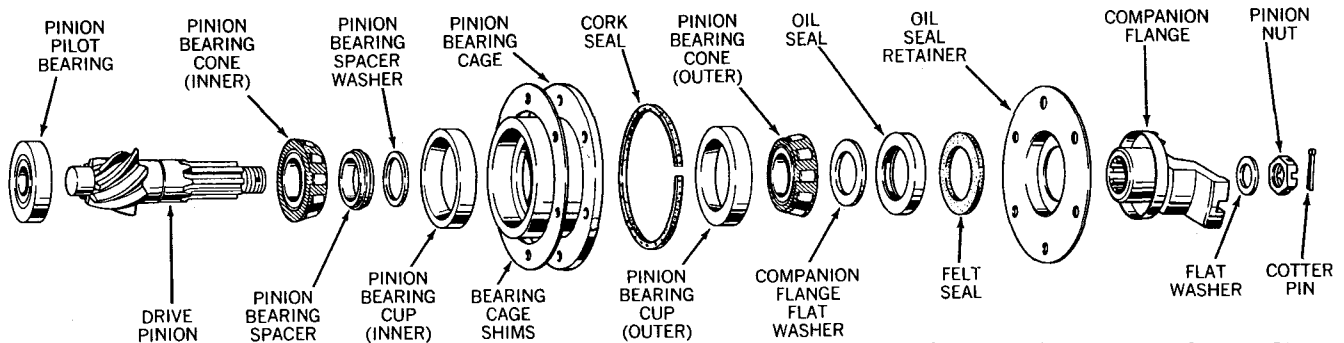
1. Rivet (cold) ring gear to flanged differential case using a press. Compress rivets to pressures shown on page 117. Some ring gears are attached to flanged differential case with bolts and locknuts. For these axles, tighten locknuts to correct torque.

2. Press bearing cones on differential cases.

NOTE: Lubricate internal parts of differential during reassembly.

3. Place thrust washer and side gear in flanged differential case. Assemble side pinions and thrust washers to spider, then place this assembly on flanged differential case (see fig. 12). Place right-hand side gear and thrust washer on side pinions.

4. Tap plain differential case into place, aligning punch marks made during disassembly. Install cap screws, bolts and nuts. Tighten nuts and cap screws to correct torque and lockwire cap screws and nuts.



assemble drive pinion

Fig. 15. Exploded View of Drive Pinion
(Companion flange flat washers and pinion bearing spacer washers are not used on all axles)

1. Press pilot bearing on drive pinion, then stake (four places) as shown in figure 16.
2. Press inner bearing cone on pinion. Place bearing spacer and spacer washer (if used) on pinion.
3. If removed, press bearing cups into pinion bearing cage. Install new felt seal and oil seal in oil seal retainer.
4. Lubricate drive pinion bearings, then place pinion bearing cage and outer bearing cone on drive pinion. Do not install oil seal retainer assembly until pinion bearing adjustment is completed.
5. Temporarily assemble companion flange to pinion as follows: Place companion flange flat washer (if used) on drive pinion. Press companion flange on drive pinion. Install and tighten pinion nut to correct torque. Rotate pinion bearing cage while tightening nut. Check pinion bearing preload adjustment. (Refer to "Adjustment" Section of this manual.)
6. With pinion bearings correctly adjusted, remove companion flange. Install new cork seal (see fig. 8) in groove of pinion bearing cage. Install oil seal retainer assembly, then reinstall companion flange, flat washer and pinion nut. Tighten nut to correct torque, then install cotter pin.

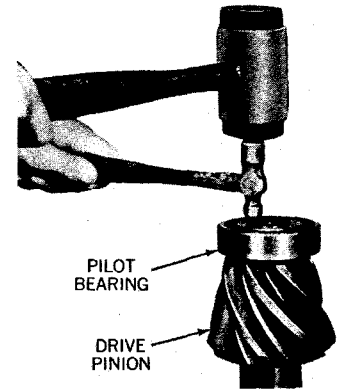


Fig. 16. Staking Pinion Pilot Bearing (Stake in four places)

assemble differential carrier

1. Install same quantity and size shims (that were removed in disassembly) on pinion bearing cage, then install drive pinion assembly in carrier. Install and tighten cap screws to correct torque.
2. Thread thrust block adjusting screw (if used) far enough into carrier to mount thrust block. Lubricate and install thrust block on end of adjusting screw.
3. Place differential assembly in carrier and install differential bearing cups (lubricate bearings), adjusters and caps. Install and tighten (finger-tight) differential bearing cap screws. Tighten adjusters to correctly seat differential bearings. Adjust ring gear and drive pinion. (Refer to "Adjustment" Section of this manual.)
4. With ring gear and drive pinion correctly adjusted, and differential bearing cap screws tightened to correct torque, install cotter pins to secure adjuster locks. Lock wire cap screws.
5. Install oil distributor (if used), spring and pipe plug (see fig. 3).

6. Adjust thrust block clearance as follows: Tighten adjusting screw (see fig. 3) to position thrust block against ring gear. Loosen adjusting screw (approximately $\frac{1}{8}$ to $\frac{1}{4}$ turn) to obtain approximately 0.010 to 0.015 in. clearance between thrust block and ring gear. Place strip sealer between carrier and lock. Tighten locknut then bend ear of lock against locknut to secure adjustment.

install differential carrier in axle housing

1. Using a new gasket, install differential carrier in axle housing. Install differential carrier to axle housing cap screws or stud nuts. Tighten cap screws or stud nuts to correct torque.
2. Install axle shafts and connect propeller shafts. Fill with correct lubricant. (Refer to "Lubrication" Section of this manual.)

adjustment

Refer to "Adjustment" Section of this manual.

lubrication

Refer to "Lubrication" Section of this manual.

2-speed axles

► DESCRIPTION AND OPERATION

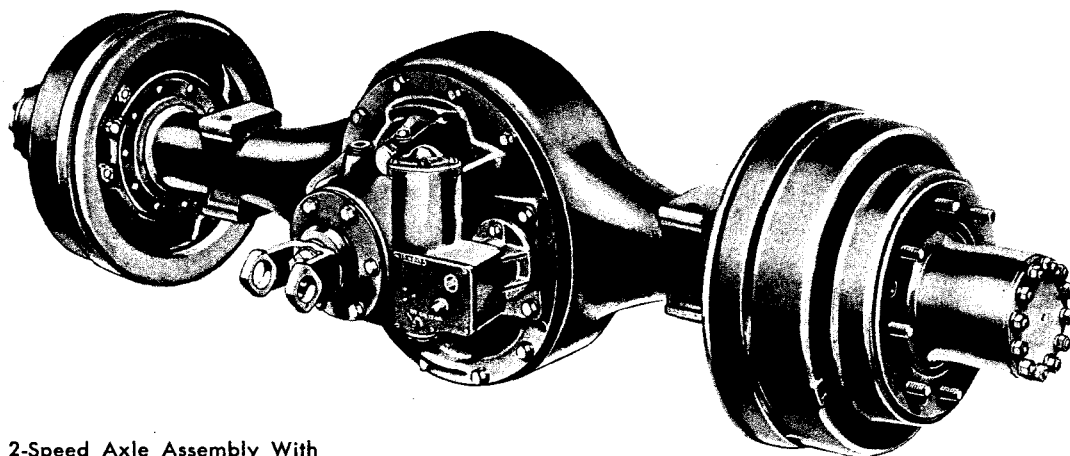


Fig. 17. 2-Speed Axle Assembly With Electric Shift Unit

The Eaton 2-Speed Axles are designed to provide correct gear ratios for various road and load conditions. One unit, combining the benefits of a single reduction axle and a double reduction axle, was the result of this development.

This axle consists of a banjo-type, full-floating axle housing and a differential and planetary assembly. A shift mechanism and sliding clutch gear provide the means of changing speed ratios.

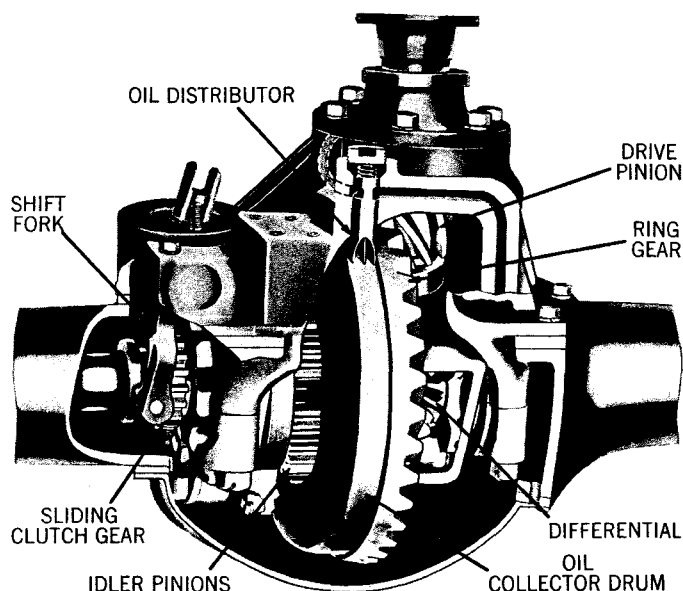


Fig. 18. Cutaway View of 2-Speed Axle Assembly

OPERATION. Change in axle ratios may be accomplished by various shifting methods. Refer to "Axle Shifting Systems" Section of this manual for information on these shifting methods.

In the High Axle Ratio, the Eaton 2-Speed Axle functions as a single reduction unit, gear reduction being obtained through a matched ring gear and drive pinion.

Refer to figure 18.

When axle is shifted into the Low Axle Ratio, the planetary gears are introduced in the power train and a secondary reduction is obtained. The 2-Speed Axle now functions as a double reduction unit . . . first reduction through the drive pinion and ring gear . . . second reduction through the planetary gears. Two ratios, as selected by the operator, are available to be used as working conditions demand.



TRUCK AXLES

2-speed axles

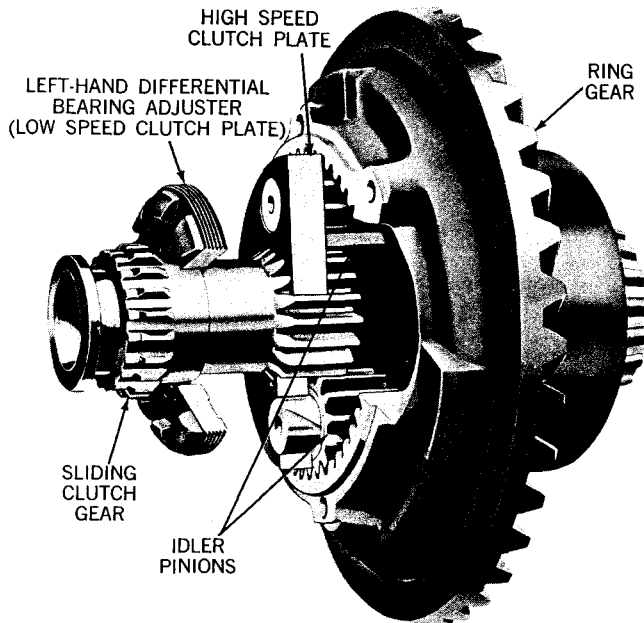


Fig. 19. Sliding Clutch Gear Position for High Axle Ratio

HIGH AXLE RATIO. In high axle ratio, the sliding clutch gear is shifted to mesh the idler pinions and the high speed clutch plate. The idler pinions are held stationary and the unit functions as a standard single reduction axle, with power flow through drive pinion, ring gear and differential unit to the axle shafts.

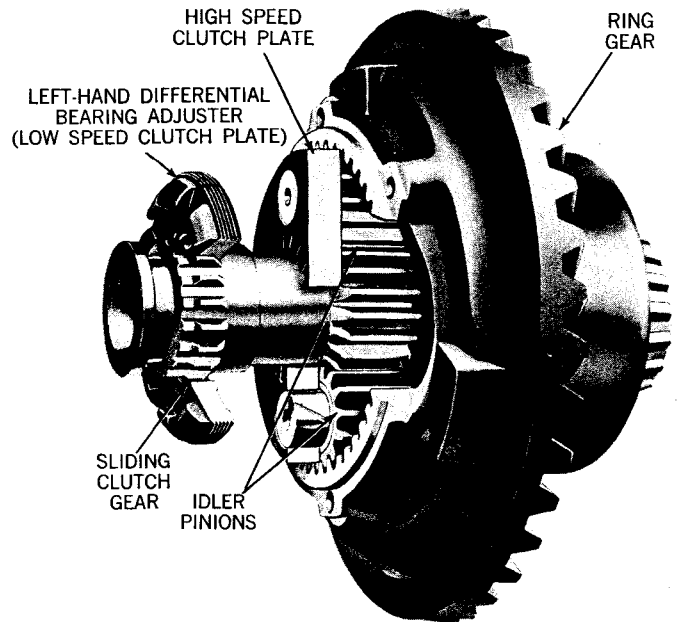


Fig. 20. Sliding Clutch Gear Position for Low Axle Ratio

LOW AXLE RATIO. In low axle ratio, the sliding clutch gear is shifted towards the differential to mesh the low speed clutch plate (low speed clutch plate is an integral part of the left-hand differential bearing adjuster) and the idler pinions. The pinions rotate around the sliding clutch gear which is held stationary. Power flow is through drive pinion, ring gear, idler pinions, and differential unit to the axle shafts. The axle functions as a double-reduction unit.

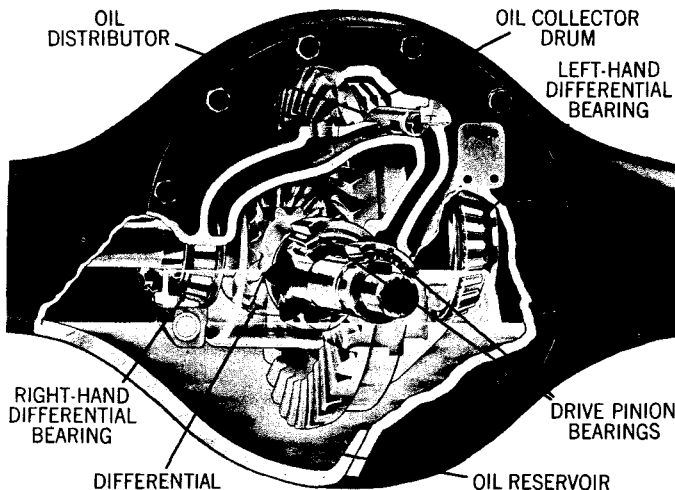


Fig. 21. 2-Speed Axle Lubricating System

LUBRICATING SYSTEM. A lubricating system is incorporated in the 2-Speed Axles to provide adequate supply of lubricant within one-half turn of the truck wheels. This system is illustrated in figure 21 and functions as follows: Oil is picked up by the oil collector drum and transmitted to the oil distributor scoop. The scoop distributes the oil in two directions; one half flows to the drive pinion bearings, the other half flows to the right-hand differential bearing, then through the differential and planetary unit to the left-hand differential bearing and back to the reservoir.

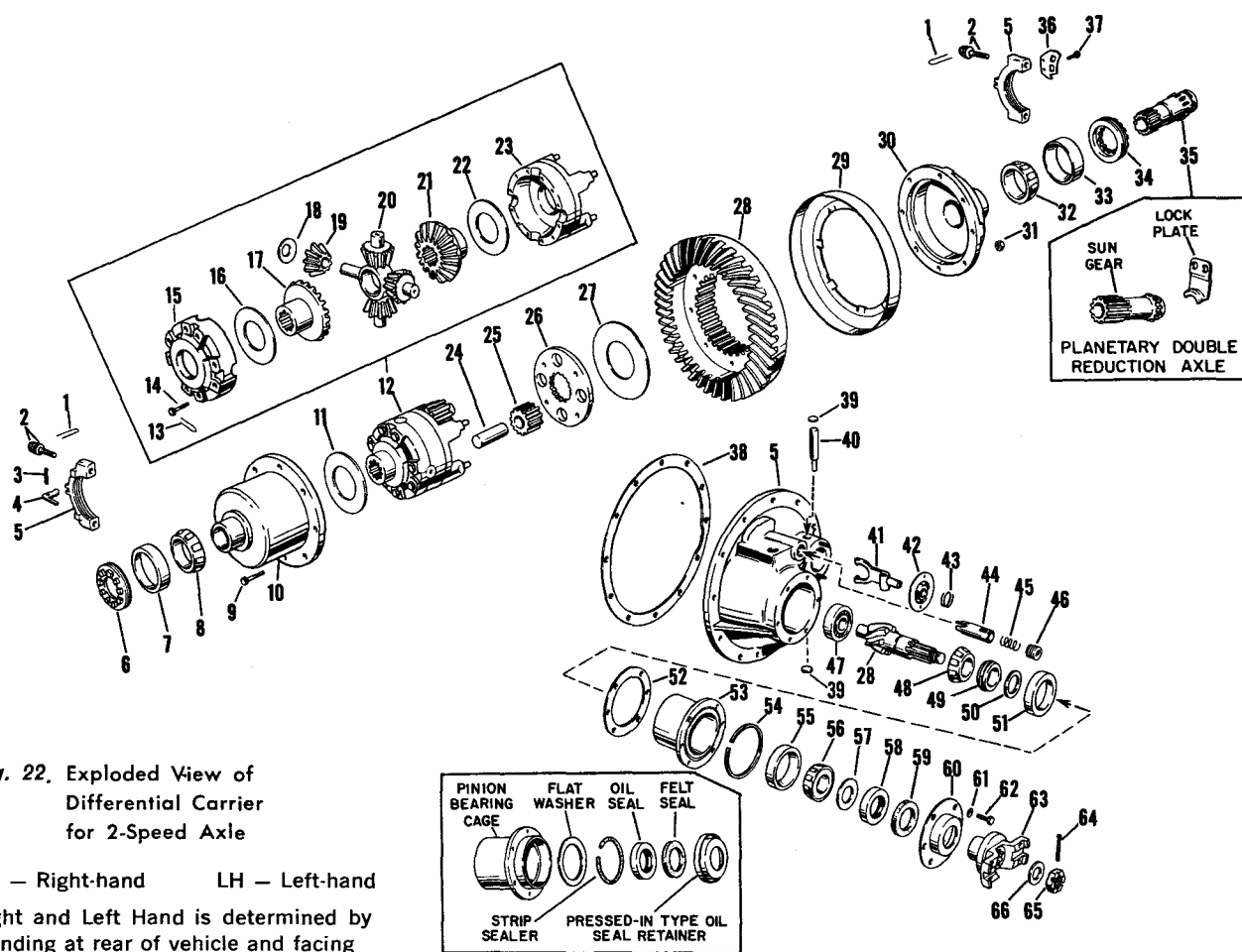


Fig. 22. Exploded View of
Differential Carrier
for 2-Speed Axle

RH — Right-hand LH — Left-hand

Right and Left Hand is determined by
standing at rear of vehicle and facing
rear of axle (as installed in vehicle.)

- | | | |
|--|--|---|
| 1. Lockwire | 25. Idler pinion | 46. Pipe plug |
| 2. Cap screw and flat washer | 26. High-speed clutch plate | 47. Pinion pilot bearing |
| 3. Cotter pin | 27. Support case thrust washer (LH) | 48. Pinion bearing cone (inner) |
| 4. Adjuster lock (RH) | 28. Ring gear and drive pinion (matched set) | 49. Pinion bearing spacer |
| 5. Differential carrier and bearing caps (matched parts) | 29. Oil collector drum | 50. Pinion bearing spacer washer |
| 6. Differential bearing adjuster (RH) | 30. Gear support case (LH half) | 51. Pinion bearing cup (inner) |
| 7. Differential bearing cup (RH) | 31. Locknut | 52. Pinion bearing cage shims |
| 8. Differential bearing cone (RH) | 32. Differential bearing cone (LH) | 53. Pinion bearing cage |
| 9. Bolt | 33. Differential bearing cup (LH) | 54. Cork seal (used with flanged-type oil seal retainer) |
| 10. Gear support case (RH half) | 34. Differential bearing adjuster (LH) (low-speed clutch plate is integral part of adjuster) | 55. Pinion bearing cup (outer) |
| 11. Support case thrust washer (RH) | 35. Sliding clutch gear | 56. Pinion bearing cone (outer) |
| 12. Differential assembly | 36. Adjuster lock (LH) | 57. Companion flange flat washer |
| 13. Lockwire | 37. Cap screw | 58. Oil seal |
| 14. Cap screw | 38. Carrier gasket | 59. Felt seal |
| 15. Differential case (RH half) | 39. Expansion plug | 60. Oil seal retainer (flanged type) (See insert for components of pressed-in type oil seal retainer) |
| 16. Side gear thrust washer (RH) | 40. Shift fork shaft | 61. Lockwasher |
| 17. Side gear (long-hub, RH) | 41. Shift fork | 62. Cap screw |
| 18. Side pinion thrust washer | 42. Shift fork seal | 63. Companion flange |
| 19. Side pinion | 43. Shift fork seal spring | 64. Cotter pin |
| 20. Spider | 44. Oil distributor | 65. Pinion nut |
| 21. Side gear (short hub, LH) | 45. Spring | 66. Flat washer |
| 22. Side gear thrust washer (LH) | | |
| 23. Differential case (LH half) | | |
| 24. Idler pinion pin | | |



► OVERHAUL

► disassembly of differential carrier

remove differential carrier from axle housing

1. Place axle in low range. Remove shift unit to differential carrier nuts and lockwashers. Disconnect electric wires, air tubing or vacuum tubing as necessary to permit removal of shift unit.

2. Drain lubricant. Disconnect propeller shaft and remove axle shafts. Remove differential carrier to axle housing cap screws and lockwashers or stud nuts. Lift out differential carrier. Discard carrier gasket.

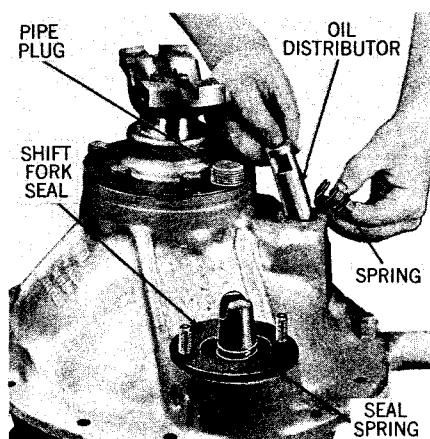
disassemble differential carrier

Fig. 23

◀ **1.** Unscrew pipe plug, then remove spring and oil distributor.

2. Remove seal and spring from shift fork. Remove expansion plugs and drive out shift fork shaft. Disengage and remove shift fork.

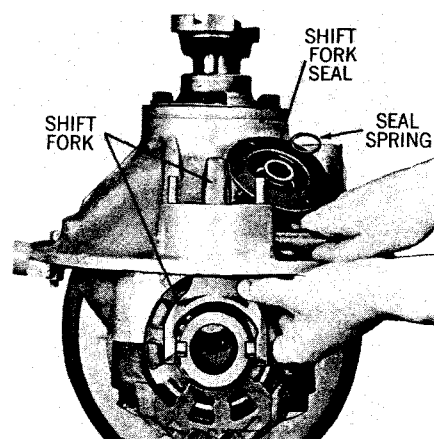


Fig. 24

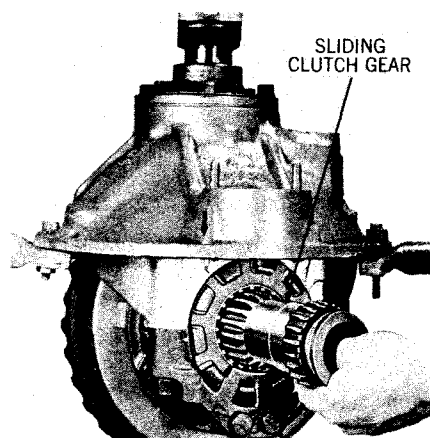


Fig. 25

⬆ **3.** Remove sliding clutch gear.

If preliminary inspection reveals that ring gear and drive pinion are satisfactory, check backlash and tooth pattern for easier adjustment in reassembly.

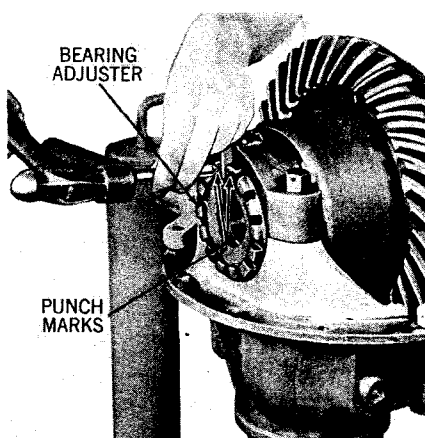


Fig. 26

⬆ **4.** Punch mark right-hand differential bearing adjuster for location of lock in reassembly. Cut lockwire and remove differential bearing cap screws. Remove right-hand differential bearing cap, bearing adjuster and lock.

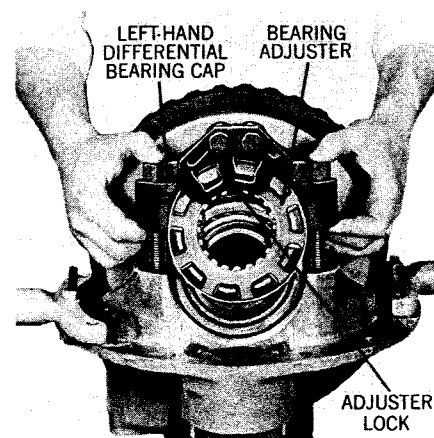


Fig. 27

⬆ **5.** Cut lockwire and remove left-hand differential bearing cap, bearing adjuster and lock as an assembly to assure correct position of ring gear during reassembly.

disassemble differential carrier (continued)

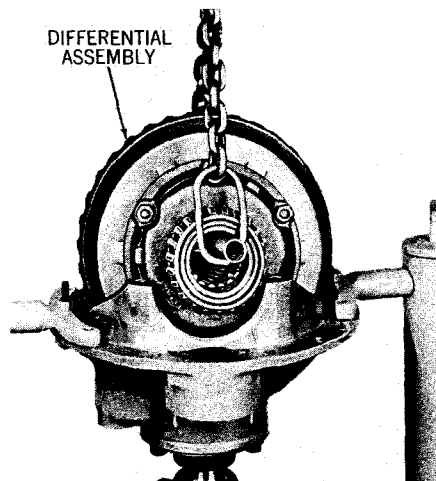


Fig. 28

6. Tilt up planetary end of differential, then lift out differential assembly.

7. Remove pinion bearing cage to differential carrier cap screws, then drive pinion assembly out of carrier, being careful not to allow assembly to fall on flange. Note size and quantity of shims on bearing cage flange for easier adjustment in reassembly.

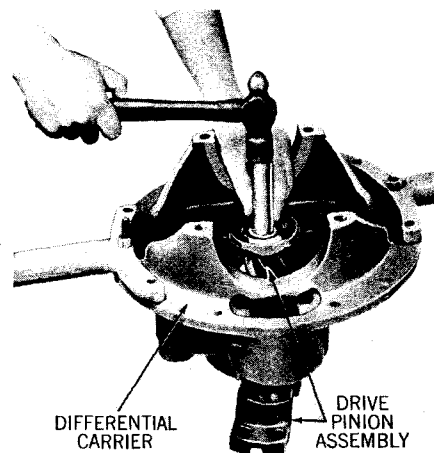


Fig. 29

disassemble drive pinion

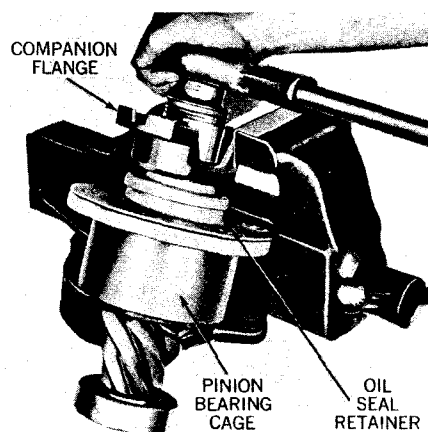


Fig. 30

1. Hold companion flange in vise, then remove cotter pin, nut and flat washer. Drive pinion out of flange.

2. With flange removed from drive pinion, remove pinion bearing cage assembly. Remove oil seal retainer assembly (flanged or pressed-in type), flange flat washer (if used) and outer bearing cone from pinion bearing cage.

3. Discard pinion bearing cage cork seal (used only with flanged-type oil seal retainer).

4. Remove oil seal and felt seal from oil seal retainer. If replacement is necessary, remove bearing cups from pinion bearing cage using suitable puller.

5. Remove pinion bearing spacer washer (if used) and spacer from drive pinion.

6. Remove inner bearing cone and pilot bearing, using pullers.

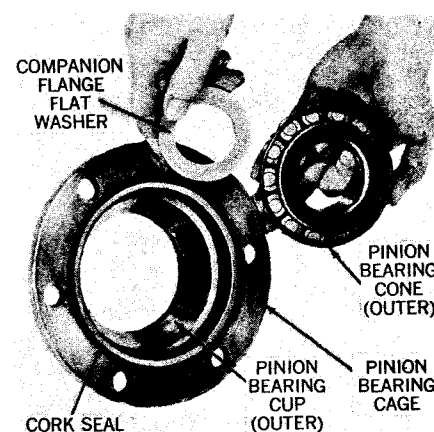


Fig. 31

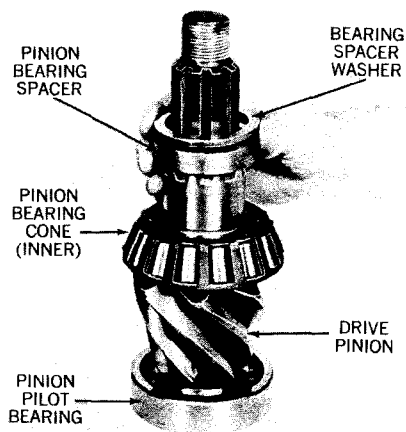


Fig. 32

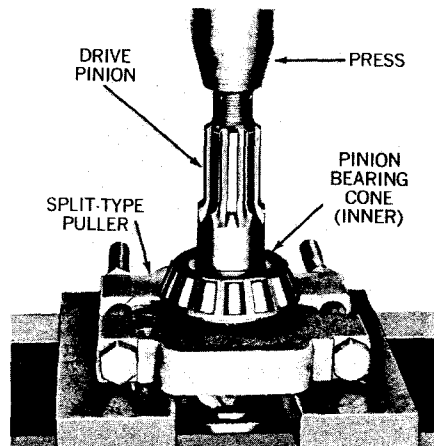


Fig. 33



disassemble differential

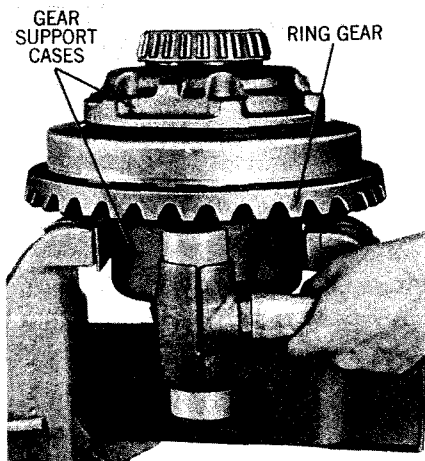


Fig. 34

1. Remove locknuts and bolts holding gear support cases together. Tap alternately on opposite sides of ring gear with soft-nosed hammer until ring gear is free of flange on support case.

2. Lift off left-hand support case, oil collector drum and thrust washer.

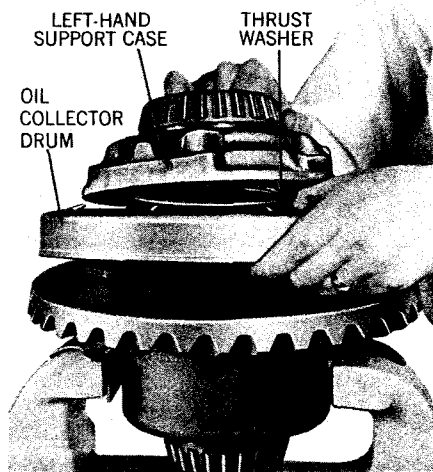


Fig. 35

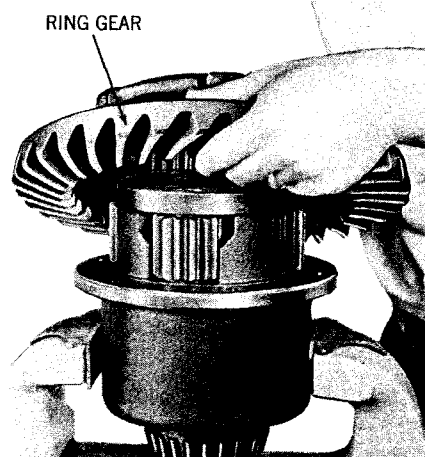


Fig. 36

3. Lift off ring gear.

4. Pry off high-speed clutch plate, then remove idler pinions and pins.

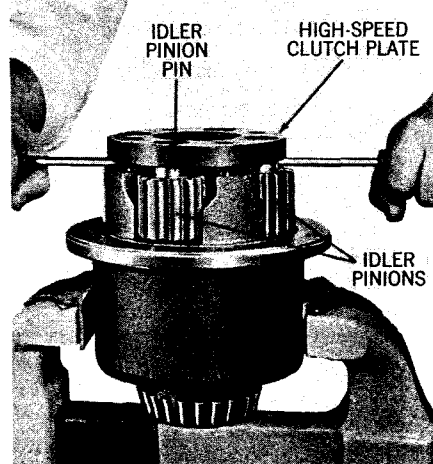


Fig. 37

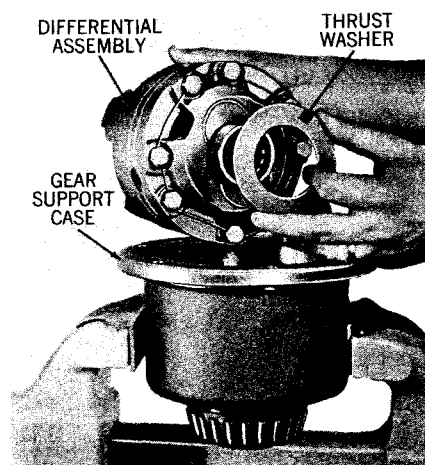


Fig. 38

5. Lift out differential assembly. Remove support case thrust washer.

6. Punch mark differential cases for correct location in reassembly. Cut lockwires and remove cap screws, then lift off right-hand differential case.

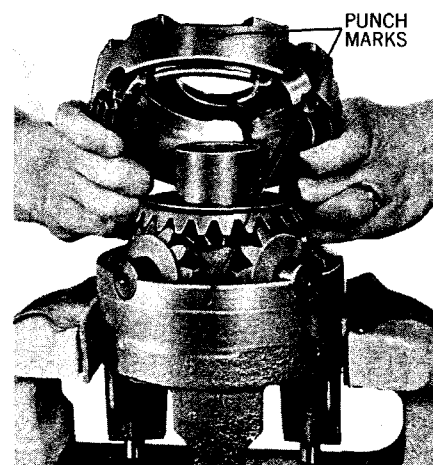


Fig. 39

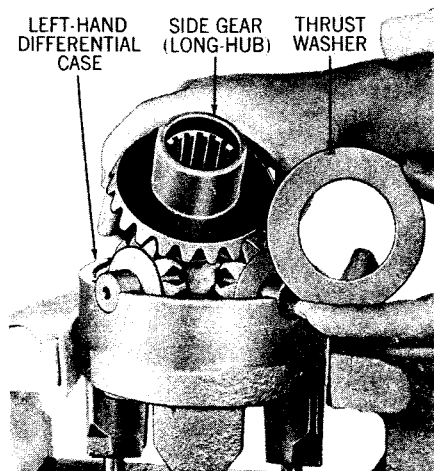
disassemble differential (continued)

Fig. 40

7. Lift out long-hub side gear and thrust washer.

8. Lift out spider, side pinions and thrust washers. Remove short-hub side gear and thrust washer from left-hand differential case.

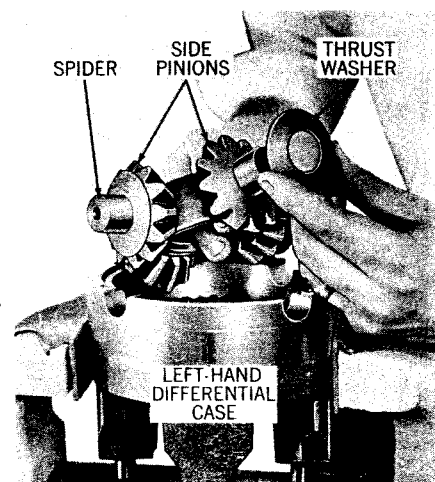


Fig. 41

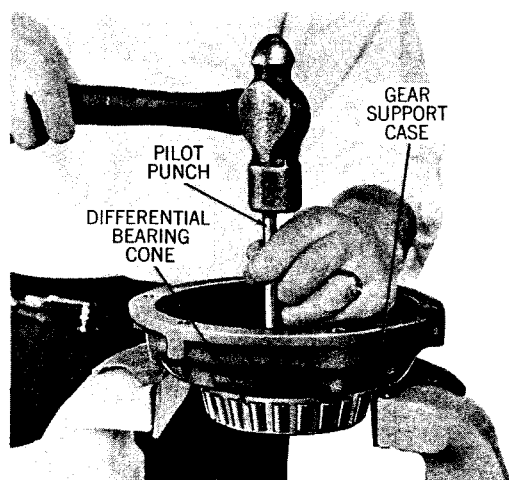


Fig. 42

9. To remove differential bearing cones, place pilot punch in holes provided in gear support case. Tap on bearing cone inner race, alternately through each hole until cone is removed. Remove bearing cones from both support cases in the same manner.

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.

► reassembly of differential carrier

For Torque Requirements . . . refer to page 118

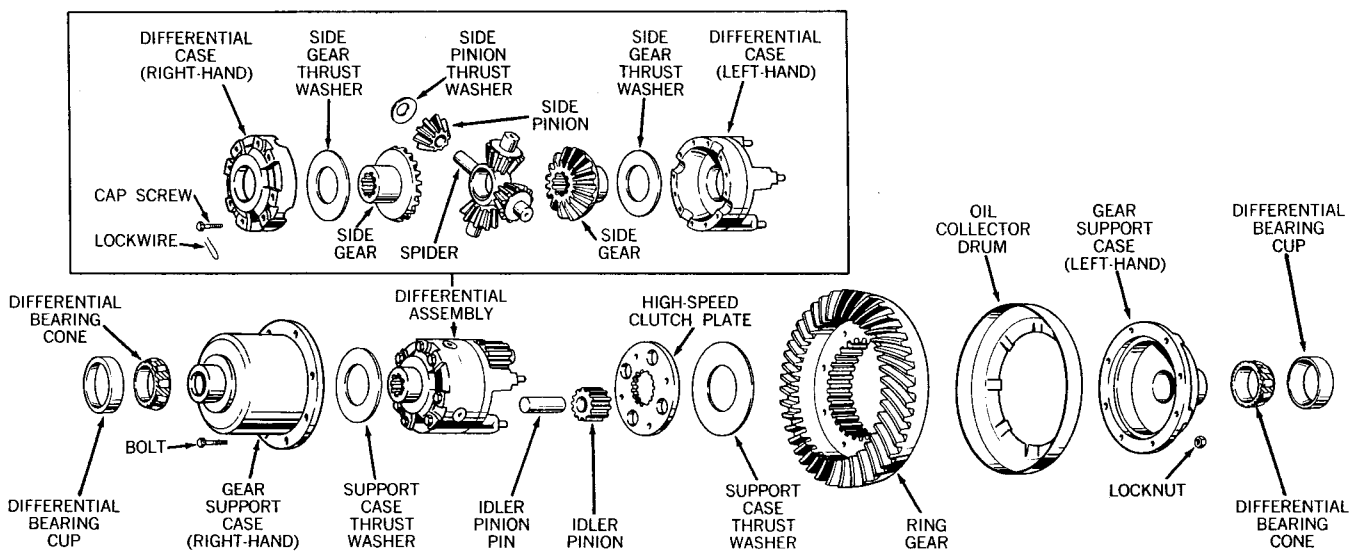


Fig. 43. Exploded View of Differential

Clutching Parts (High Speed Clutch Plate, Differential Bearing Adjuster and Sliding Gear) with 35° conical angle are available for 17, 18, 19 and 20 Series Single Axles or 34D and 38D 2-Speed and 3-Speed Tandem Axles. When disassembling differential carrier for service (and clutching parts need replacement), it is recommended that old clutching parts be replaced with new-style 35° conical angle parts.

Lubricate internal parts of differential during reassembly.

assemble differential

- 1.** Press bearing cones on gear support cases.
- 2.** Place thrust washer and short-hub side gear in left-hand differential case. Assemble side pinions and thrust washers to spider, then place this assembly in left-hand differential case (see fig. 41).
- 3.** Place long-hub side gear with thrust washer on side pinions. Place right-hand differential case over differential gears, aligning punch marks on both cases, then install cap screws. Tighten cap screws to correct torque, then lockwire cap screws.
- 4.** Place right-hand support case thrust washer and differential assembly in right-hand support case (see fig. 38). Install idler pins and pinions. Place high speed clutch

plate on idler pinions. *Make certain that chamfered teeth of clutch plate are positioned toward idler pinions.*

- 5. NOTE:** Prior to installing collector drum, bend tangs slightly to provide tension between drum and support case. Mount ring gear, oil collector drum, thrust washer and left-hand support case on right-hand support case. During assembly of these parts, temporarily place two bolts in mounting holes. This procedure will assure bolt hole alignment as these parts are assembled into final position. Secure assembly with bolts and locknuts. Temporarily install sliding clutch gear and rotate idler pinions to make sure parts are assembled correctly. Tighten locknuts to correct torque.

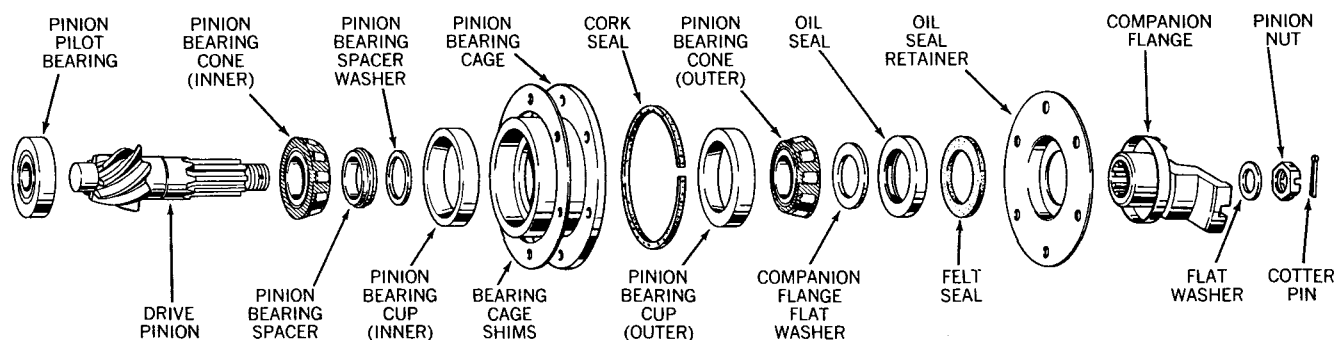


Fig. 44. Exploded View of Drive Pinion
(Companion flange flat washers and pinion bearing spacer washers are not used on all axles)

assemble drive pinion

- 1.** Press pinion pilot bearing on drive pinion, then stake as shown in figure 45.
- 2.** Press inner bearing cone on drive pinion.
- 3.** If removed, press bearing cups in pinion bearing cage.
- 4.** Install new felt seal and oil seal in retainer.
- 5.** Lubricate drive pinion bearings. Place pinion bearing spacer, spacer washer (if used), bearing cage, and outer bearing cone on drive pinion. Do not install oil seal retainer assembly until pinion bearing adjustment is completed.
- 6.** Temporarily assemble companion flange as follows: Place flange flat washer (if used) on drive pinion. Press flange on pinion and install flat washer and pinion nut. Tighten pinion nut to correct torque. Rotate bearing cage while tightening pinion nut. Check pinion bearing preload adjustment. (Refer to "Adjustment" Section of this manual.)
- 7.** To install oil seal retainer assembly (after drive pinion bearings are correctly adjusted) remove nut, flat washer and companion flange. Install oil seal retainer assembly (pressed-in type mounts in recess of bearing cage with flat washer positioned between bearing cage recess and oil seal retainer; flanged type is attached with same cap screws that fasten bearing cage). Install companion flange, flat washer and pinion nut. Tighten pinion nut to correct torque, then install cotter pin.

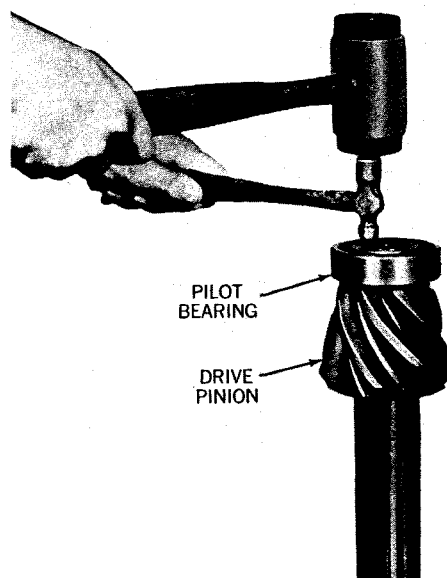


Fig. 45. Staking Pinion Pilot Bearing
(Stake in four places.)



2-speed axles

assemble differential carrier

1. Using same quantity and size shims (*that were removed during disassembly*) on pinion bearing cage flange, install drive pinion assembly in carrier. Install bearing cage cap screws and lockwashers. Tighten cap screws to correct torque.

Lubricate differential bearings during reassembly.

2. Place differential assembly in carrier and install differential bearing cups. Install assembled left-hand differential bearing cap, adjuster and lock. Install right-hand differential bearing cap and adjuster. Install and tighten (*finger-tight*) differential bearing cap screws. Tighten right-hand bearing adjuster to correctly seat differential bearings. Adjust ring gear and drive pinion. (Refer to "Adjustment" Section of this manual.)

3. With ring gear and drive pinion correctly adjusted and differential bearing cap screws tightened to correct torque, install cotter pins to secure locks, then lockwire cap screws.

4. Install sliding clutch gear.

5. Install and engage shift fork with sliding clutch gear. Install shift fork shaft and expansion plugs.

6. Place seal on shift fork with bottom hole (*stamped on seal*) over lower stud. Install spring on seal.

7. Install oil distributor, spring, and pipe plug in carrier (see fig. 23).

install differential carrier in axle housing

1. Using a new gasket, install differential carrier in axle housing. Install differential carrier to axle housing cap screws and lockwashers or stud nuts. Tighten cap screws or stud nuts to correct torque. Install axle shafts and connect propeller shaft. Fill with correct lubricant. (Refer to "Lubrication" Section of this manual.)

2. Install electric shift unit or air-torsion spring unit on carrier, engaging swivel with slot in shift fork shaft. Install mounting nuts and lockwashers. For electric shift, connect electric wires. For air-torsion spring shift, connect air line to unit.

adjustment

Refer to "Adjustment" Section of this manual.

lubrication

Refer to "Lubrication" Section of this manual.

planetary double reduction axles

► DESCRIPTION AND OPERATION

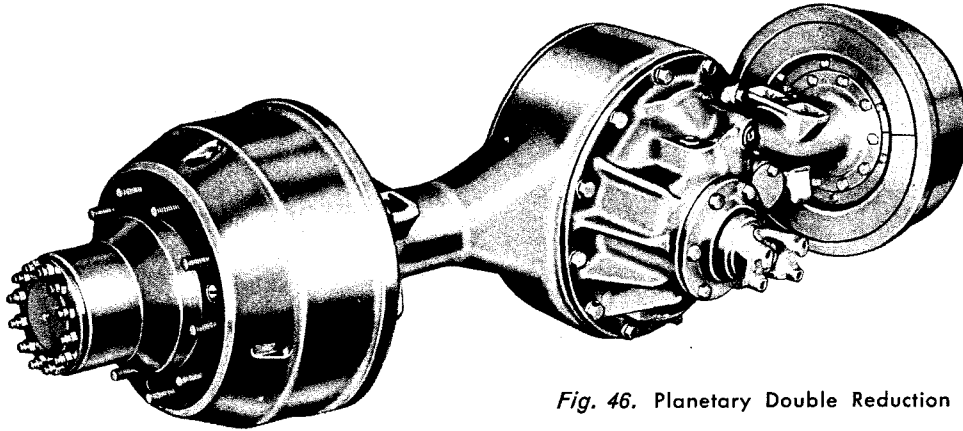


Fig. 46. Planetary Double Reduction Axle Assembly.

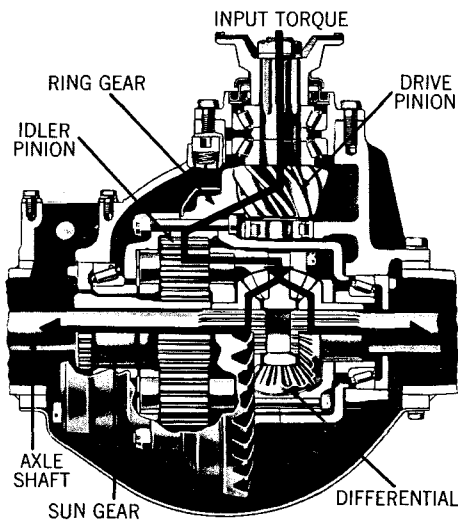


Fig. 47. Power Flow Through Planetary Double Reduction Axle

The Eaton Planetary Double Reduction Axle is designed to provide a compact unit with heavy-duty load capacity. This is accomplished by incorporating a rugged ring gear and drive pinion set and a durable planetary unit in a single axle housing.

OPERATION. (See fig. 47). Input torque is received by the drive pinion. The first reduction is between the ring gear and drive pinion. The ring gear is provided with internal teeth, which enclose the idler pinions (planetary). The idler pinions revolve around the stationary sun gear to provide the second reduction. The planetary gearing transmits torque through the axle

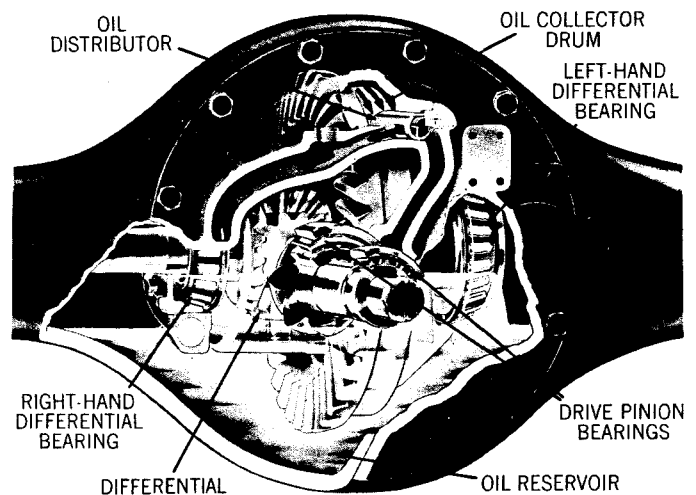


Fig. 48. Planetary Double Reduction Axle Lubricating System

differential, axle shafts and wheels.

LUBRICATING SYSTEM. A lubricating system is incorporated in the Planetary Double Reduction Axles to provide adequate supply of lubricant within one-half turn of the truck wheels. This system is illustrated in figure 48 and functions as follows: Oil is picked up by the oil drum and transmitted to the oil distributor scoop. The scoop distributes the oil in two directions; one-half flows to the drive pinion bearings, the other half flows to the right-hand differential bearing, then through the differential and planetary unit to the left-hand differential bearing and back to the reservoir.



planetary double reduction axles

► OVERHAUL

► disassembly of differential carrier

remove differential carrier from axle housing

1. Drain lubricant. Disconnect propeller shaft and remove axle shafts. Remove differential carrier to axle housing cap screws and lockwashers or stud nuts. Lift out differential carrier. Discard carrier gasket.

disassemble differential carrier

Procedures for disassembly of differential carrier, drive pinion and differential are the same as the Eaton 2-Speed Axle (refer to separate section of this manual), except for the following:

1. Planetary Double Reduction Axle does not use a shift mechanism.
2. A sun gear is used in place of the sliding clutch gear. To remove the sun gear, remove the retainer which holds the sun gear in position, then remove sun gear (see fig. 22)

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.

► reassembly of differential carrier

assemble differential carrier

Procedures for reassembly of differential, drive pinion and differential carrier are the same as the Eaton 2-Speed Axle (refer to separate section of this manual), except for the following:

1. The Planetary Double Reduction Axle is not equipped with shift mechanism.
2. A sun gear is used in place of the sliding clutch gear. After installing sun gear, install sun gear retainer and fasten with same cap screws used to attach left-hand bearing adjuster lock.

install differential carrier in axle housing

1. Using a new gasket, install differential carrier in axle housing. Install differential carrier to axle housing cap screws and lockwashers or stud nuts. Tighten cap screws to correct torque. Install axle shafts and connect propeller shaft. Fill with correct lubricant. (Refer to "Lubrication" Section of this manual).

adjustment

Refer to "Adjustment" Section of this manual.

lubrication

Refer to "Lubrication" Section of this manual.

"D" series tandem drive axles

► DESCRIPTION AND OPERATION

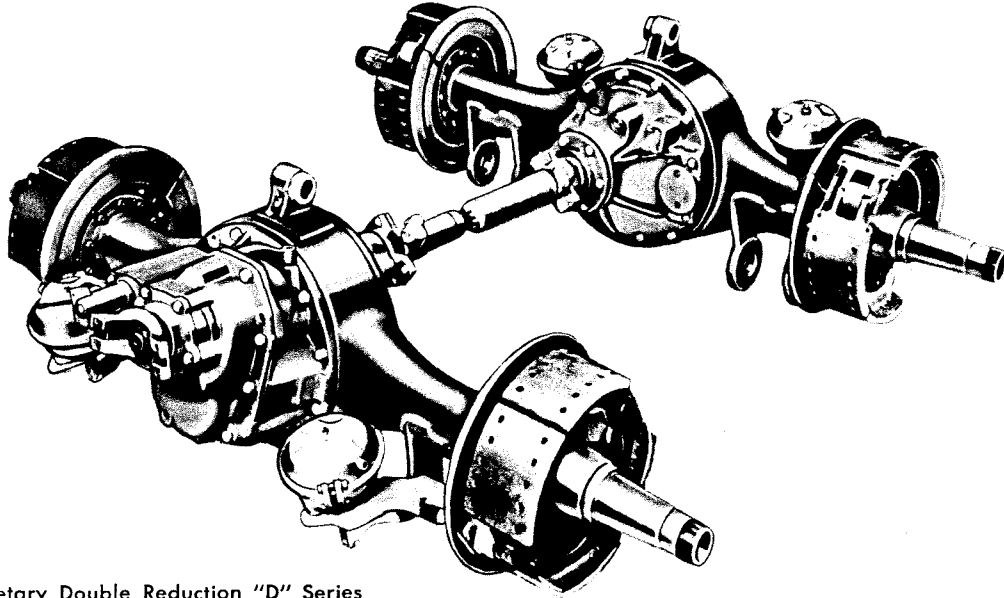


Fig. 49. Planetary Double Reduction "D" Series Tandem Drive Axle Assembly.

The Eaton "D" Series Tandem Drive Axles consist of two axle units coupled by a Power Divider Unit. This combination drive offers inter-axle differentiation for

easier steering and better roadability. The design prevents axle fight and permits freer rolling for greater economy.

MODEL DIFFERENCES. The "D" Series Tandem Drive Axles are available in four different designs depending upon the prevailing operating conditions for the particular vehicle. These designs are listed in the following chart:

"D" SERIES TANDEM DRIVE AXLE TYPE	FORWARD REAR AXLE	REAR REAR AXLE
Single Reduction	Single Reduction with Power Divider	Single Reduction
2-Speed	2-Speed with Power Divider	2-Speed
Planetary Double Reduction	Planetary Double Reduction with Power Divider	Planetary Double Reduction
3-Speed	2-Speed with Power Divider	2-Speed



TRUCK AXLES

"D" series tandem drive axles

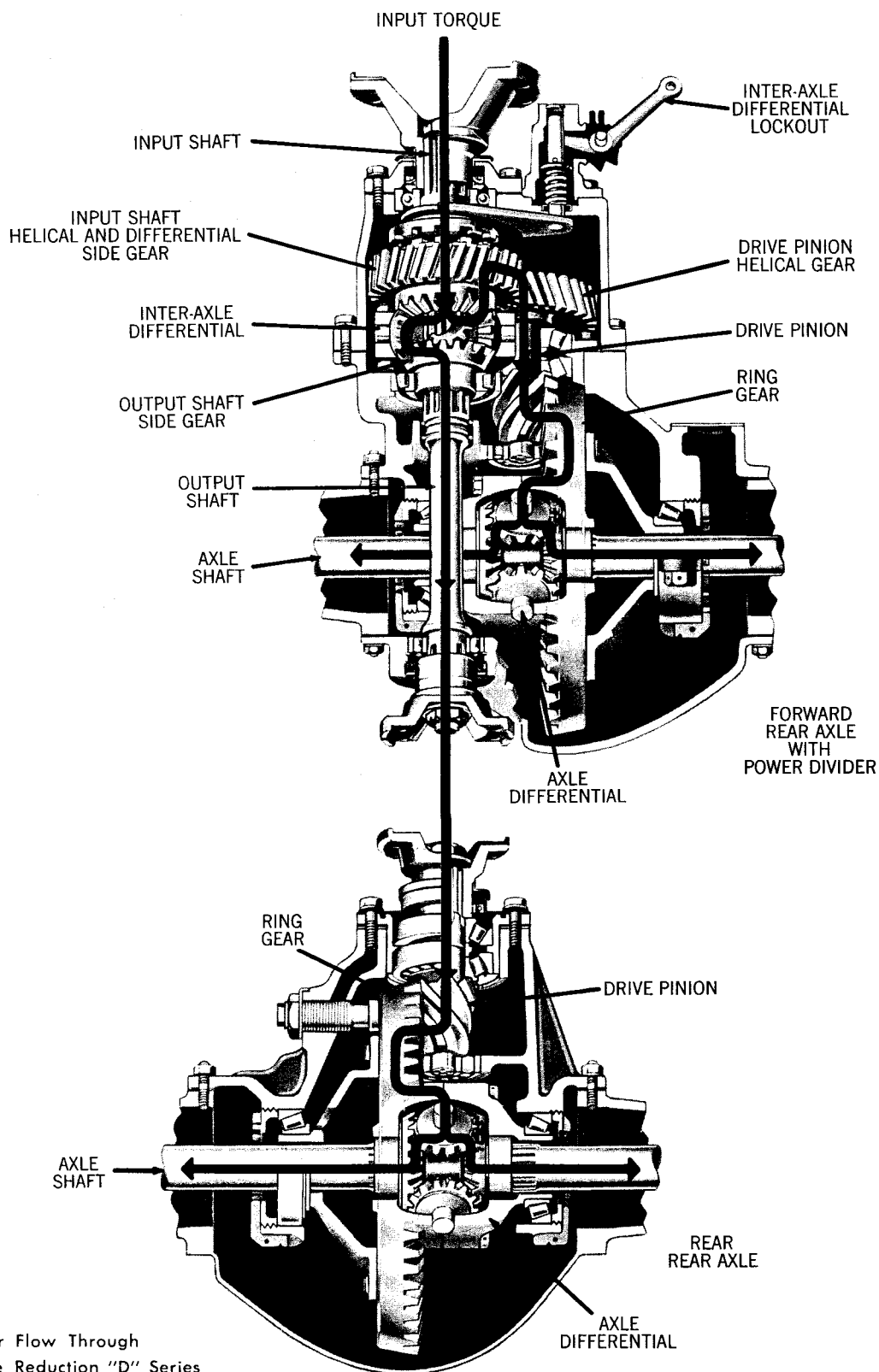


Fig. 50. Power Flow Through Single Reduction "D" Series Tandem Drive Axle

OPERATION. The power divider unit equally distributes power from the vehicle transmission to both the forward and rear rear axles. The inter-axle differential unit (mounted on the input shaft) operates the same as a conventional axle differential, providing differential action between the forward rear axle and the rear rear axle. The differential in each drive axle unit provides differential action for its respective wheels.

Power flow for the "D" Series Tandem Drive Axles is shown in figure 50. Input torque from vehicle transmission is transmitted to the input shaft and to the splined inter-axle differential spider. At this point, torque is transmitted through the inter-axle differential to forward and rear rear axles as follows:

(1). Power is transferred from spider through a "floating" helical-side gear (mounted on input shaft), drive pinion helical gear to drive pinion and ring gear of the forward rear axle.

(2). Power is transferred from spider through output shaft side gear, output shaft, through inter-axle propeller shaft to the drive pinion and ring gear of the rear rear axle.

Thus, by using the inter-axle differential as a power distribution point for the two axles, differential action is provided between the forward and rear rear axles.

When the inter-axle differential is not in operation (*lockout mechanism engaged . . . refer to lockout mechanism description below*), the input shaft, input shaft "floating" helical-side gear and inter-axle differential rotate as one assembly. Power is then transferred to both axles without differential action. The forward axle drive pinion is driven from input shaft "floating" helical-side gear to the drive pinion helical gear. The rear rear axle drive pinion is driven from output shaft side gear, through output shaft and inter-axle propeller shaft.

LOCKOUT MECHANISM. A lockout mechanism is used on the forward rear axle to lock out the inter-axle differential and provide maximum traction when road conditions are unfavorable.

The lockout mechanism consists of a sliding clutch (mounted on the power divider input shaft), shift fork and push rod, and control system. The shift fork may be operated by an air-operated shift cylinder or vacuum-operated control.

When the lockout mechanism is engaged by the driver, the sliding clutch engages the helical and differ-

ential side gear and locks out the inter-axle differential action. This provides a positive drive to both axles.

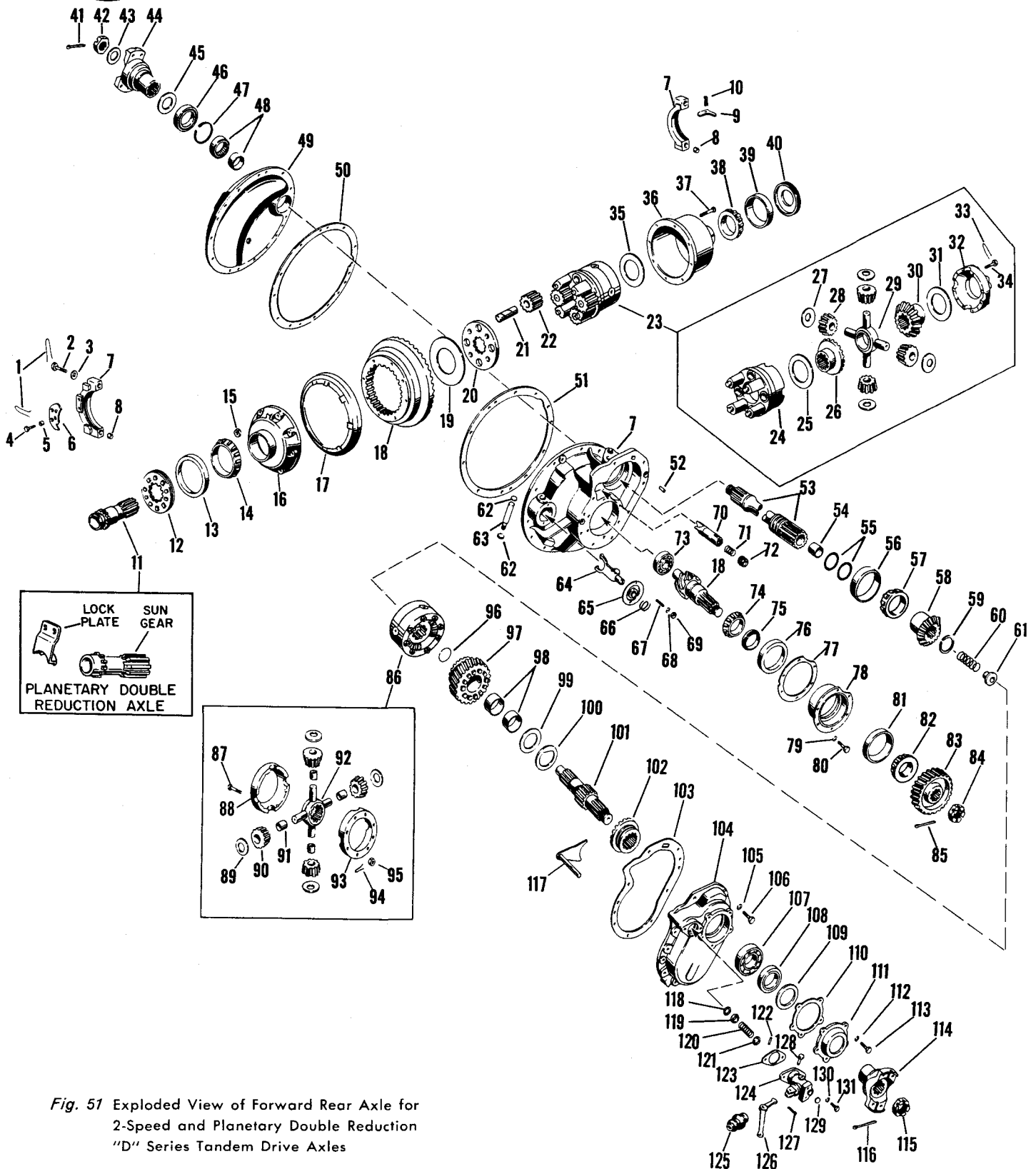
When the lockout control is released, a spring on the shift fork push rod operates to automatically disengage the sliding clutch from the helical and differential side gear, and inter-axle differential action is again restored.

The lockout control should be placed in the locked-out position, only at slow speeds. Never move control while wheels are slipping. Continuous unnecessary use of lockout must be avoided, as such use would cause abnormal tire wear.



TRUCK AXLES

"D" series tandem drive axles



LEGEND FOR FIGURE 51

Forward Rear Axle for 2-Speed and Planetary Double Reduction "D" Series Tandem Drive Axles

RH — Right-hand LH — Left-hand

Right and Left Hand is determined by standing at rear of vehicle and facing rear of axle (as installed in vehicle)

- | | | |
|--|--|--|
| 1. Lockwire | 42. Output shaft nut | 89. Side pinion thrust washer |
| 2. Cap screw | 43. Flat washer | 90. Side pinion |
| 3. Flat washer | 44. Output companion flange | 91. Side pinion bushing |
| 4. Cap screw | 45. Rear bearing retainer washer | 92. Spider |
| 5. Dowel bushing | 46. Oil seal | 93. Inter-axle differential case (male half) |
| 6. Adjuster lock (RH) | 47. Rear bearing snap ring | 94. Lockwire |
| 7. Differential carrier and bearing caps (matched parts) | 48. Output shaft rear bearing and sleeve (matched parts) | 95. Nut |
| 8. Dowel bushing | 49. Axle housing cover | 96. Input shaft snap ring |
| 9. Adjuster lock (LH) | 50. Cover gasket | 97. Helical and differential side gear |
| 10. Cotter pin | 51. Carrier gasket | 98. Helical and differential side gear bushings |
| 11. Sliding clutch gear | 52. Dowel pins | 99. Helical and differential side gear thrust washer |
| 12. Differential bearing adjuster (RH) (low speed clutch plate is integral part of adjuster) | 53. Output shaft | 100. Helical and differential side gear "D" washer |
| 13. Differential bearing cup (RH) | 54. Output shaft bushing | 101. Input shaft |
| 14. Differential bearing cone (RH) | 55. Output shaft "O" rings | 102. Input shaft sliding clutch |
| 15. Locknut | 56. Output shaft front bearing cup | 103. Differential carrier cover gasket |
| 16. Gear support case (RH half) | 57. Output shaft front bearing cone | 104. Differential carrier cover |
| 17. Oil collector drum | 58. Output shaft side gear | 105. Lockwasher |
| 18. Ring gear and drive pinion (matched set) | 59. Output shaft snap ring | 106. Cap screw |
| 19. Support case thrust washer (RH) | 60. Output shaft holdout spring | 107. Input shaft bearing |
| 20. High speed clutch plate | 61. Output shaft holdout thrust washer | 108. Oil seal |
| 21. Idler pinion pins | 62. Expansion plug | 109. Felt seal |
| 22. Idler pinions | 63. Shift fork shaft | 110. Bearing cover shims |
| 23. Differential assembly | 64. Shift fork | 111. Bearing cover |
| 24. Differential case (RH half) | 65. Shift fork seal | 112. Lockwasher |
| 25. Side gear thrust washer (RH) | 66. Seal spring | 113. Cap screw |
| 26. Side gear (short hub, RH) | 67. Stud | 114. Input companion flange |
| 27. Side pinion thrust washer | 68. Lockwasher | 115. Input shaft nut |
| 28. Side pinion | 69. Stud nut | 116. Cotter pin |
| 29. Spider | 70. Oil distributor | 117. Shift fork and push rod |
| 30. Side gear (long hub, LH) | 71. Spring | 118. Felt seal |
| 31. Side gear thrust washer (LH) | 72. Pipe plug | 119. Seal retainer |
| 32. Differential case (LH half) | 73. Pinion pilot bearing | 120. Compression spring |
| 33. Lockwire | 74. Pinion bearing cone (inner) | 121. Retainer washer |
| 34. Cap screw | 75. Pinion bearing spacer | 122. Retainer washer pin |
| 35. Support case thrust washer (LH) | 76. Pinion bearing cup (inner) | 123. Shift lever bracket gasket |
| 36. Gear support case (LH half) | 77. Pinion bearing cage shims | 124. Shift lever bracket |
| 37. Bolt | 78. Pinion bearing cage | 125. Shift lever boot |
| 38. Differential bearing cone (LH) | 79. Lockwasher | 126. Shift lever |
| 39. Differential bearing cup (LH) | 80. Cap screw | 127. Cotter pin |
| 40. Differential bearing adjuster (LH) | 81. Pinion bearing cup (outer) | 128. Clevis pin |
| 41. Cotter pin | 82. Pinion bearing cone (outer) | 129. Expansion plug |
| | 83. Pinion helical gear | 130. Lockwasher |
| | 84. Pinion nut | 131. Cap screw |
| | 85. Cotter pin | |
| | 86. Inter-axle differential assembly | |
| | 87. Bolt | |
| | 88. Inter-axle differential case (female half) | |



TRUCK AXLES

"D" series tandem drive axles

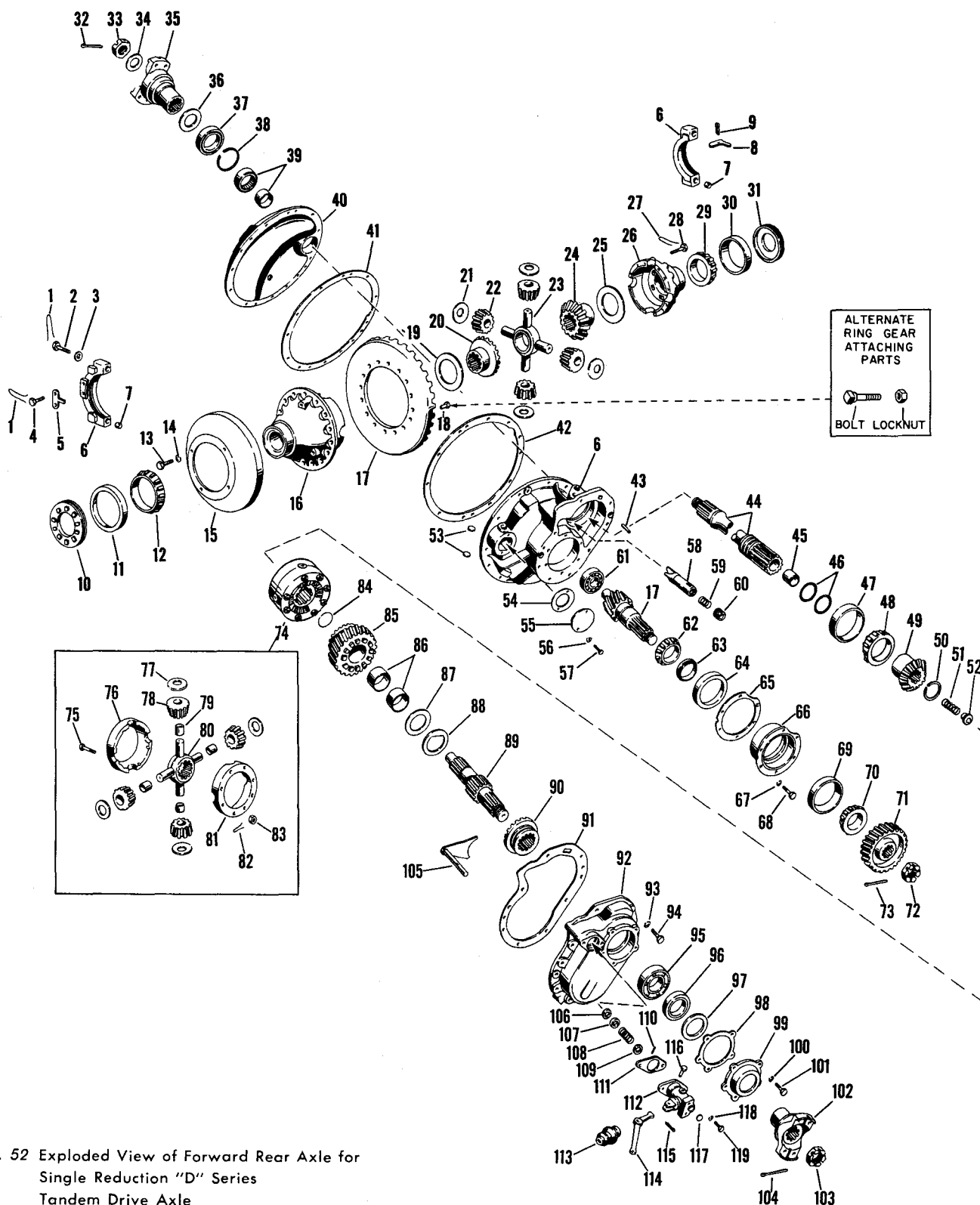


Fig. 52 Exploded View of Forward Rear Axle for Single Reduction "D" Series Tandem Drive Axle

LEGEND FOR FIGURE 52

Forward Rear Axle for Single Reduction "D" Series Tandem Drive Axle

RH — Right-hand LH — Left-hand

Right and Left Hand is determined by standing at rear of vehicle and facing rear of axle (as installed in vehicle)

- | | | |
|--|--|--|
| 1. Lockwire | 40. Axle housing cover | 82. Lockwire |
| 2. Cap screw | 41. Cover gasket | 83. Nut |
| 3. Flat washer | 42. Carrier gasket | 84. Input shaft snap ring |
| 4. Cap screw | 43. Dowel pins | 85. Helical and differential side gear |
| 5. Adjuster lock (RH) | 44. Output shaft | 86. Helical and differential side gear bushings |
| 6. Differential carrier and bearing caps (matched parts) | 45. Output shaft bushing | 87. Helical and differential side gear thrust washer |
| 7. Dowel bushing | 46. Output shaft "O" rings | 88. Helical and differential side gear "D" washer |
| 8. Adjuster lock (LH) | 47. Output shaft front bearing cup | 89. Input shaft |
| 9. Cotter pin | 48. Output shaft front bearing cone | 90. Input shaft sliding clutch |
| 10. Differential bearing adjuster | 49. Output shaft side gear | 91. Differential carrier cover gasket |
| 11. Differential bearing cup (RH) | 50. Output shaft snap ring | 92. Differential carrier cover |
| 12. Differential bearing cone (RH) | 51. Output shaft holdout spring | 93. Lockwasher |
| 13. Cap screw | 52. Output shaft holdout thrust washer | 94. Cap screw |
| 14. Lockwasher | 53. Expansion plug | 95. Input shaft bearing |
| 15. Oil collector drum | 54. Hole cover gasket | 96. Oil seal |
| 16. Differential case (RH half) | 55. Hole cover | 97. Felt seal |
| 17. Ring gear and drive pinion (matched set) | 56. Lockwasher | 98. Bearing cover shims |
| 18. Rivet | 57. Cap Screw | 99. Bearing cover |
| 19. Side gear thrust washer (RH) | 58. Oil distributor | 100. Lockwasher |
| 20. Side gear (RH) | 59. Spring | 101. Cap screw |
| 21. Side pinion thrust washer | 60. Pipe plug | 102. Input companion flange |
| 22. Side pinion | 61. Pinion pilot bearing | 103. Input shaft nut |
| 23. Spider | 62. Pinion bearing cone (inner) | 104. Cotter pin |
| 24. Side gear (LH) | 63. Pinion bearing spacer | 105. Shift fork and push rod |
| 25. Side gear thrust washer (LH) | 64. Pinion bearing cup (inner) | 106. Felt seal |
| 26. Differential case (LH half) | 65. Pinion bearing cage shims | 107. Seal retainer |
| 27. Lockwire | 66. Pinion bearing cage | 108. Compression spring |
| 28. Cap screw | 67. Lockwasher | 109. Retainer washer |
| 29. Differential bearing cone (LH) | 68. Cap screw | 110. Retainer washer pin |
| 30. Differential bearing cup (LH) | 69. Pinion bearing cup (outer) | 111. Shift lever bracket gasket |
| 31. Differential bearing adjuster (LH) | 70. Pinion bearing cone (outer) | 112. Shift lever bracket |
| 32. Cotter pin | 71. Pinion helical gear | 113. Shift lever boot |
| 33. Output shaft nut | 72. Pinion nut | 114. Shift lever |
| 34. Flat washer | 73. Cotter pin | 115. Cotter pin |
| 35. Output companion flange | 74. Inter-axle differential assembly | 116. Clevis pin |
| 36. Rear bearing retainer washer | 75. Bolt | 117. Expansion plug |
| 37. Oil seal | 76. Inter-axle differential case (female half) | 118. Lockwasher |
| 38. Rear bearing snap ring | 77. Side pinion thrust washer | 119. Cap screw |
| 39. Output shaft rear bearing and sleeve (matched parts) | 78. Side pinion | |
| | 79. Side pinion bushing | |
| | 80. Spider | |
| | 81. Inter-axle differential case (male half) | |

► REAR REAR AXLE OVERHAUL

The rear rear axle unit of the "D" Series Tandem Drive Axles is a Single Reduction, 2-Speed or Planetary Double Reduction unit, depending on the assembly used in the forward rear axle. Refer to the appropriate Section

of this manual for instructions covering the Eaton "Single Reduction Axles," "2-Speed Axles," or "Planetary Double Reduction Axles."

► FORWARD REAR AXLE OVERHAUL

► removal of differential carrier and power divider assembly

It is recommended (but not necessary) that the axle housing cover be removed to replace differential carrier and power divider assembly.

remove and disassemble axle housing cover

1. Drain lubricant. Disconnect propeller shafts at companion flanges and remove axle shafts.
2. Remove cotter pin, nut, flat washer, companion flange and retainer washer from output shaft.
3. Remove cover to axle housing stud nuts and lockwashers. Remove cover assembly and discard cover gasket.

4. To disassemble axle housing cover, remove oil seal from output shaft opening, using suitable puller. Remove snap ring from output shaft opening, then press rear bearing from axle housing cover. *Rear bearing sleeve is mounted on the output shaft.*

remove differential carrier and power divider assembly from axle housing

1. Disconnect lockout shift lever connections.
2. If axle is "2-Speed", remove shift units. (Refer to "2-Speed Axle" Section of this manual.)
3. Remove carrier to axle housing stud nuts and lockwashers. Lift and pull differential carrier and power divider assembly out of axle housing.

► disassembly of differential carrier and power divider

remove differential carrier cover

1. Place differential carrier and power divider assembly in repair stand.

If preliminary inspection reveals that ring gear and drive pinion are satisfactory, check backlash and tooth contact pattern for easier adjustment in reassembly.

2. Remove carrier cover to differential carrier cap screws and lockwashers, then remove carrier cover assembly.

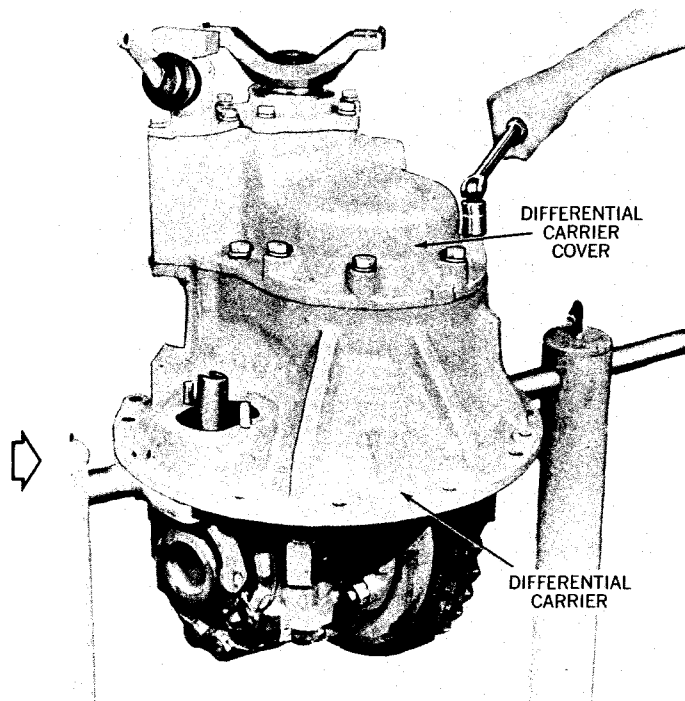


Fig. 53.

remove and disassemble inter-axle differential

1. Lift inter-axle differential off output shaft side gear.
2. Before disassembling inter-axle differential, punch mark cases for correct position during reassembly. Cut lockwire and remove nuts and bolts. Separate cases and remove thrust washers, side pinions, bushings and spider.

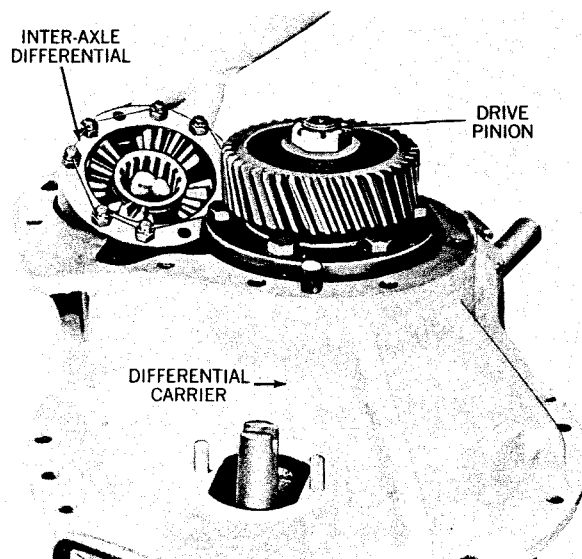


Fig. 54.

remove and disassemble output shaft

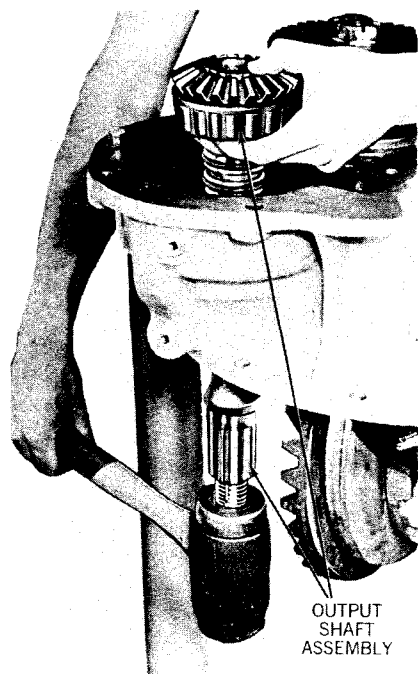


Fig. 55.



1. Remove output shaft holdout spring and thrust washer. Lift output shaft assembly from differential carrier, tapping at companion flange end of shaft. Remove bearing cup from carrier.

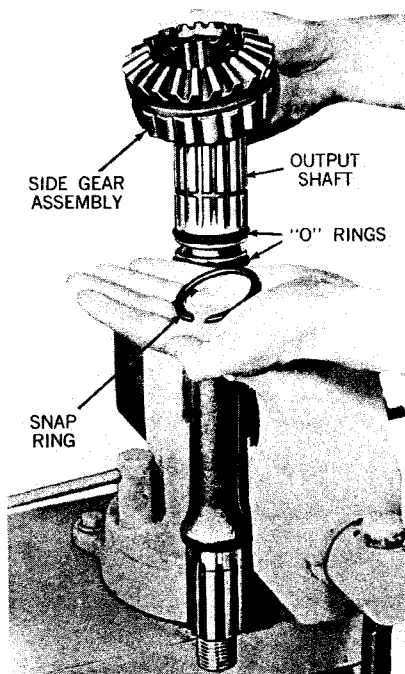


Fig. 56.



2. To disassemble output shaft, remove snap ring, then lift off side gear assembly. Discard output shaft "O" rings. If replacement is necessary, remove bushing from bore of output shaft.

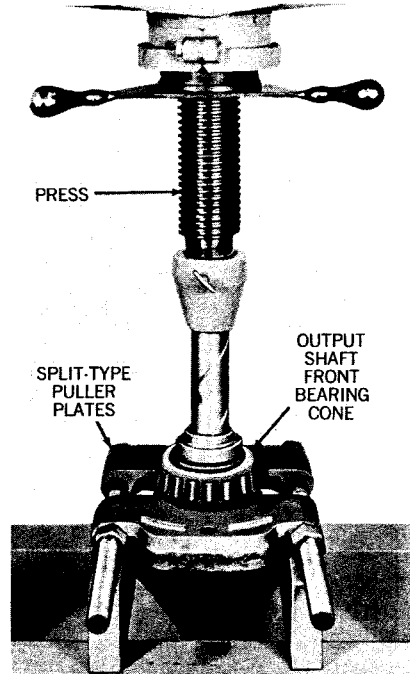


Fig. 57.



3. To remove output shaft front bearing cone from side gear, place side gear assembly in press with split-type puller plates under front bearing cone, then press side gear out of front bearing cone.



TRUCK AXLES

"D" series tandem drive axles

remove and disassemble input shaft

1. Remove snap ring from input shaft, then lift off helical-side gear, helical-side gear thrust washer and "D" washer. If replacement is necessary, press bushings from bore of helical-side gear.

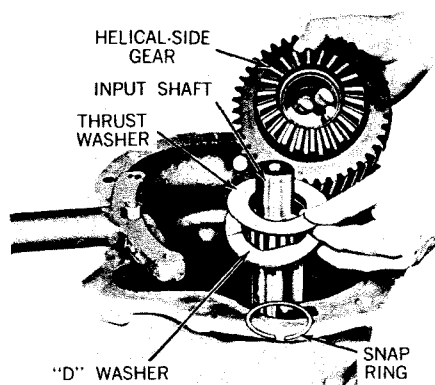


Fig. 58.

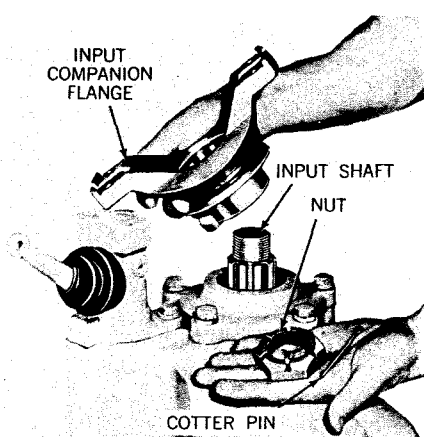


Fig. 59.

2. Remove cotter pin, nut and input companion flange from input shaft.

3. Remove input shaft bearing cover to differential carrier cover cap screws, then lift off bearing cover assembly and shims. *Note size and quantity of shims for easier adjustment during re-assembly.* Remove oil seal and felt seal from bearing cover.

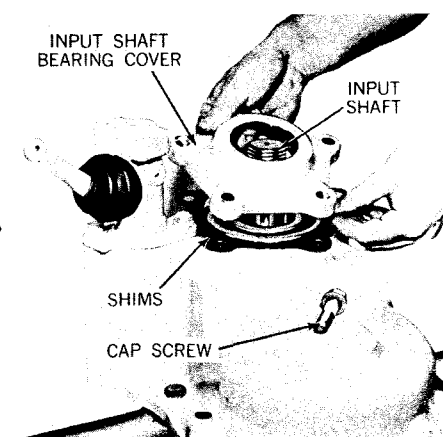


Fig. 60.

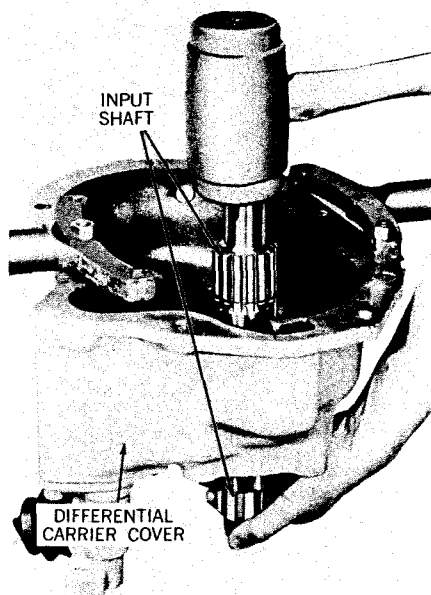


Fig. 61.

4. Drive input shaft out of differential carrier cover.

5. To remove bearing from input shaft, place assembly in a press with threaded end of input shaft upward. Press input shaft out of bearing.

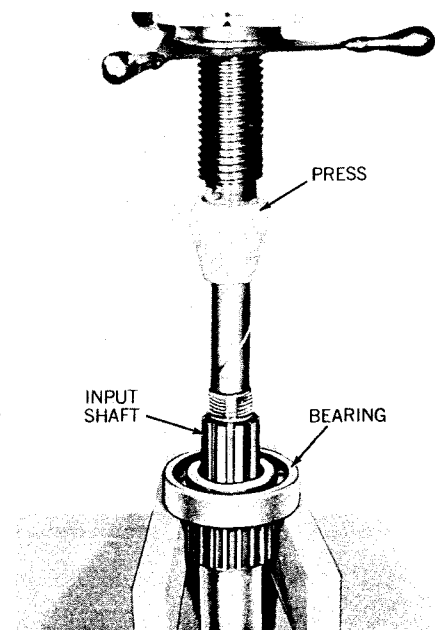


Fig. 62.

remove lockout mechanism (vacuum-operated type)

Either vacuum-operated or air-operated lockout may be used on the "D" Series Axles. Refer to page 65 for instructions on air-operated lockout. The following instructions are for vacuum-operated lockout.

1. Pull boot off lockout shift lever. Remove cotter pin and clevis pin, then remove shift lever.

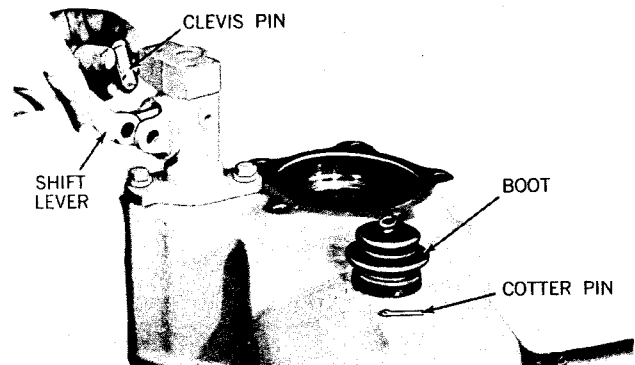


Fig. 63.

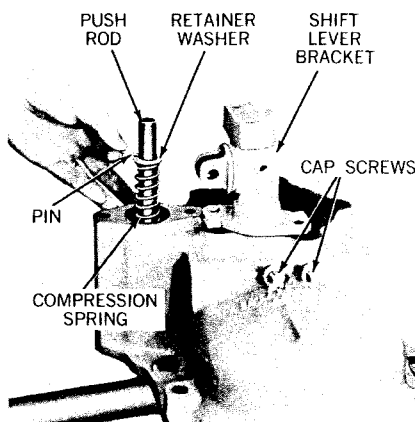


Fig. 64.

2. Remove shift lever bracket to differential carrier cover cap screws and lockwashers, then lift off bracket. Compress compression spring, then remove pin, retainer washer and compression spring from shift fork and push rod.

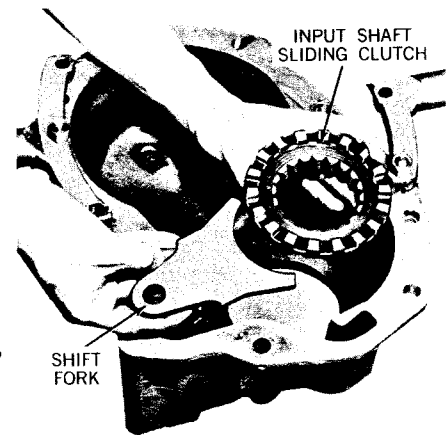


Fig. 65.

3. Lift input shaft sliding clutch and shift fork and push rod assembly from differential carrier cover.

loosen drive pinion helical gear nut

Before removing differential assembly, remove cotter pin and loosen drive pinion helical gear nut.

remove and disassemble axle differential

Be sure to remove pipe plug, spring and oil distributor from differential carrier before attempting to remove differential assembly.

Refer to separate sections of this manual for instructions covering Single Reduction, 2-Speed, or Planetary Double Reduction Axles.

remove and disassemble drive pinion

Refer to separate sections of this manual for instructions covering Single Reduction, 2-Speed and Planetary

Double Reduction Axles, except for the following variations:

The drive pinions for the individual axles are equipped with companion flanges (see fig. 15). For this type installation, the pinion bearing cage cap screws are accessible to permit removal of pinion with flange assembled.

The drive pinions for "D" Series Tandem Axle units are equipped with a helical gear (see fig. 66), which must be removed to gain access to pinion bearing cage cap screws. Therefore, to remove drive pinion, remove nut (previously loosened before differential removal).

Mount bearing puller on helical gear, gripping gear with puller legs and placing puller screw against pinion. Then pull gear off pinion. Remove pinion bearing cage cap screws, then remove drive pinion assembly.

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.

► reassembly of differential carrier and power divider

For Torque Requirements...refer to page 120

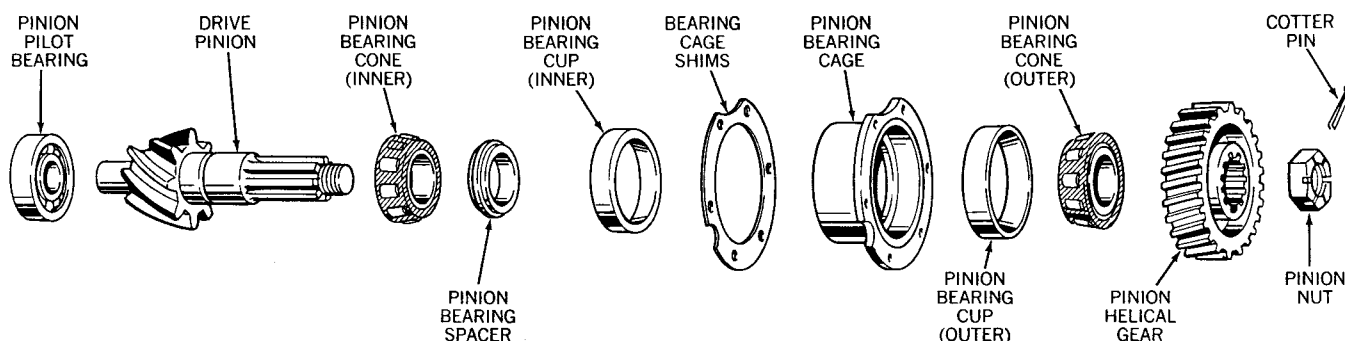


Fig. 66. Exploded View of Drive Pinion

assemble and install drive pinion

Refer to separate sections of this manual for instructions covering Single Reduction, 2-Speed, and Planetary Reduction Axles, except for the following variation:

The drive pinions for the standard axle units are equipped with companion flanges (see fig. 15). The pinion bearing cage cap screws are accessible to permit installation of pinion with companion flange installed.

The drive pinions for the "D" Series Tandem Axle units are equipped with a helical gear (see fig. 66) and the bearing cage cap screws cannot be installed with helical gear attached to drive pinion. Install pinion in "D" Series Tandem Axle units with helical gear removed. After pinion is installed, then place helical gear on pinion. Install and tighten pinion nut to correct torque, then install cotter pin.

assemble and install axle differential

Refer to separate sections of this manual for instructions covering Single Reduction, 2-Speed, and Planetary Double Reduction Axles.

Be sure to install oil distributor, spring and pipe plug before installing differential carrier cover.

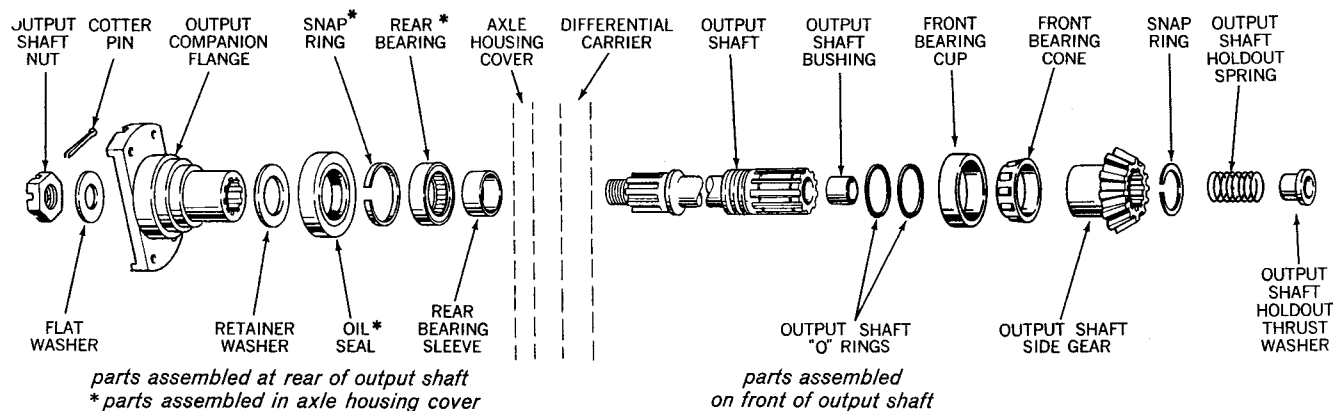


Fig. 67. Exploded View of Output Shaft and Axle Housing Cover Parts

With drive pinion and axle differential assembled in differential carrier and correctly adjusted, install power divider components as indicated in the following instructions:

assemble and install output shaft

NOTE: If output shaft is equipped with a ball bearing, it is recommended that the ball bearing be replaced with a tapered-type bearing cup and cone assembly, holdout spring and thrust washer.

1. If removed, press front bearing cup in differential carrier.
2. If removed, press bushing in bore of output shaft.
3. Press front bearing cone on output shaft side gear. Place side gear assembly on output shaft and install snap ring.
4. Install two "O" rings in grooves of output shaft.
5. Lubricate output shaft "O" rings, front bearing and bushing, then install output shaft assembly in differential carrier by placing front bearing cone on bearing cup in bore of carrier.

assemble and install inter-axle differential

Lubricate internal parts of inter-axle differential during reassembly.

1. Install bushings, side pinions and thrust washers on journals of differential spider.

2. Place spider assembly in male differential case. Install female differential case, aligning punch marks (made during disassembly) and secure assembly with bolts and nuts. Tighten nuts to correct torque and install lockwire.

3. Place inter-axle differential on the output shaft side gear which is mounted on output shaft. Position differential with nuts away from output shaft side gear.

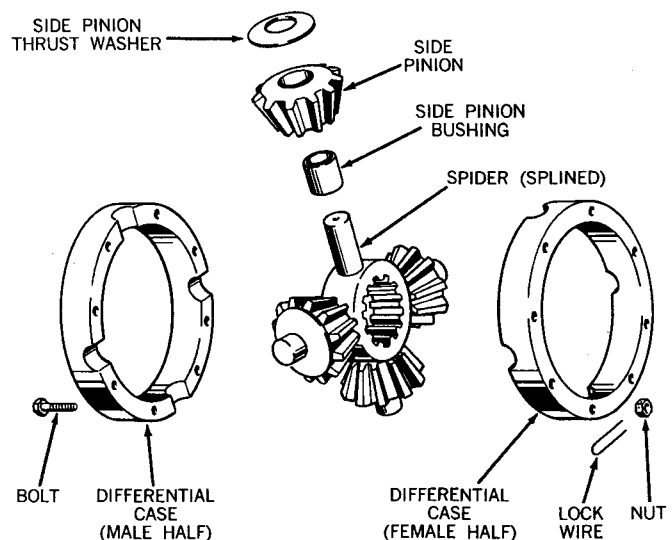


Fig. 68. Exploded View of Inter-Axle Differential

install lockout mechanism (vacuum-operated type)

Either vacuum-operated or air-operated lockout may be used on the "D" Series Axles. Refer to page 66 for instructions covering air-operated lockout. The following instructions are for vacuum-operated lockout.

1. Install felt seal and seal retainer in recess in carrier cover. Engage lockout shift fork with groove in input shaft sliding clutch. Place this assembly in differential carrier cover.
2. Place compression spring and retainer washer on push rod, depress spring and install retainer washer pin. Coat spring and retainer washer with grease.
3. Install new gasket and shift lever bracket on differential carrier cover and install cap screws and lockwashers. Tight-

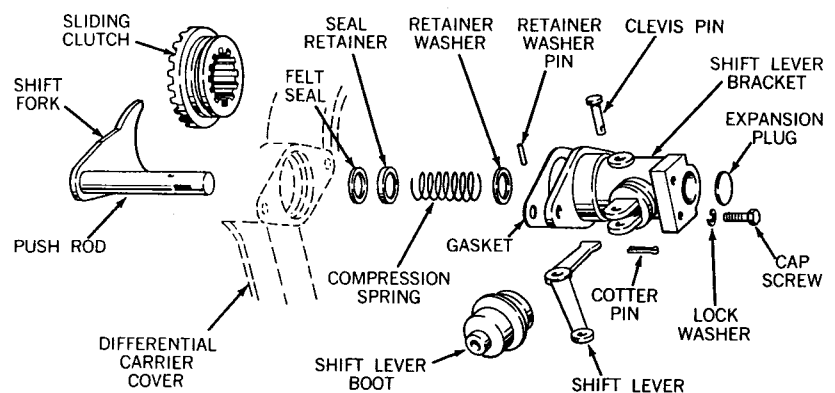


Fig. 69. Exploded View of Vacuum-Operated Lockout Mechanism

en screws to correct torque. If removed, install grease fitting in bracket.

4. Place lockout shift lever in bracket, engaging slot in push rod. Install clevis pin and cotter pin.
5. Place boot over shift lever and secure boot to bracket.



TRUCK AXLES

"D" series tandem drive axles

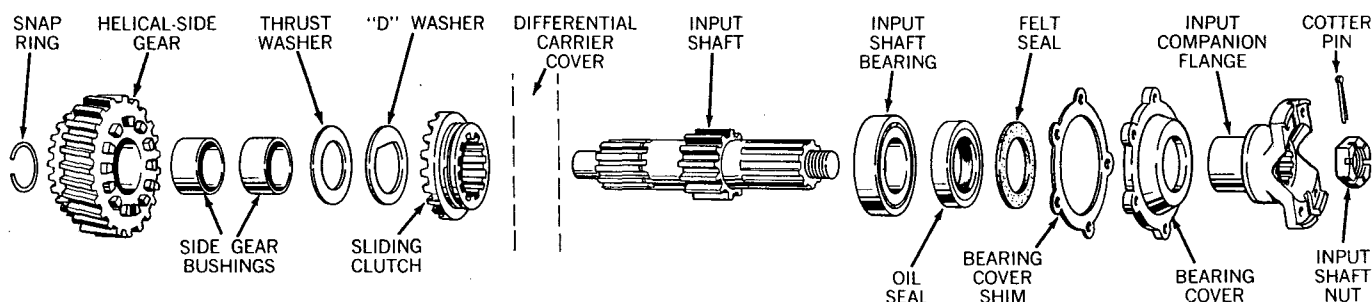


Fig. 70. Exploded View of Input Shaft

assemble and install input shaft

1. Press bearing on threaded end of input shaft.
2. Place input shaft assembly in differential carrier cover, engaging sliding clutch.
3. Install felt seal and oil seal in input shaft bearing cover. Using same size and quantity of shims removed during disassembly, install shims and bearing cover on carrier cover. Install cap screws (*finger-tight*) and lockwashers.

BEARING CLEARANCE

To check bearing adjustment or determine thickness of shims required, install bearing cover on carrier cover without shims. Install and tighten cap screws (*finger-tight*). Then, using a feeler gage, measure clearance between bearing cover and carrier cover. This clearance measurement plus 0.003 inch would equal the thickness of shims required for correct bearing clearance.

4. Install input companion flange and nut on input shaft. Tighten nut to correct torque and install cotter pin. Tighten input shaft bearing cover cap screws to correct torque.

5. If removed, press two bushings in bore of helical-side gear. Place "D" washer, thrust washer and helical-side gear assembly on input shaft. Install snap ring on input shaft to secure these parts.

install differential carrier cover

1. Place output shaft holdout spring and thrust washer in output shaft hole. Thrust washer is to be positioned to contact input shaft.
2. Place new cover gasket on differential carrier. Place carrier cover assembly on differential carrier, aligning dowel pins with holes in cover. During reassembly of cover to carrier, slowly rotate input shaft to engage input shaft splines with splines in bore of inter-axle differential spider. Carefully install two cover cap screws, watching for possible binding between cover and carrier. If cover assembles to carrier without bind, install remaining cap screws and tighten to correct torque.

After carrier cover is assembled to differential carrier, check operation of inter-axle differential. Hold output shaft stationary and rotate input companion flange. If the assembly differentiates, the unit is correctly assembled.

► installation of differential carrier and power divider assembly

install differential carrier and power divider assembly in axle housing

1. Place new carrier gasket on differential carrier. Install differential carrier and power divider assembly in axle housing. Install and tighten stud nuts to correct torque.

assemble and install axle housing cover

1. Before installing axle housing cover, assemble cover as follows (see fig. 67): Press output shaft rear bearing in cover. Install snap ring to secure bearing. Press oil seal in same opening in axle housing cover.
2. Place new cover gasket on axle housing and install axle housing cover assembly, taking care not to damage oil seal. Install stud nuts and lockwashers. Tighten stud nuts to correct torque.

3. Install rear bearing sleeve on output shaft. Install retainer washer, output companion flange, flat washer and nut on output shaft. Tighten nut to correct torque and install cotter pin.

install shafts, controls and lubricate

1. Install axle shafts and fill axle with correct lubricant. (Refer to "Lubrication" Section of this manual.) Connect propeller shafts to companion flanges.
2. On 2-Speed Axles, install axle shift units. (Refer to "2-Speed Axle" Section of this manual.)
3. Connect lockout shift lever connections.

adjustments

Refer to "Adjustment" Section of this manual.

lubrication

Refer to "Lubrication" Section of this manual.

"M" series tandem drive axles

► DESCRIPTION AND OPERATION

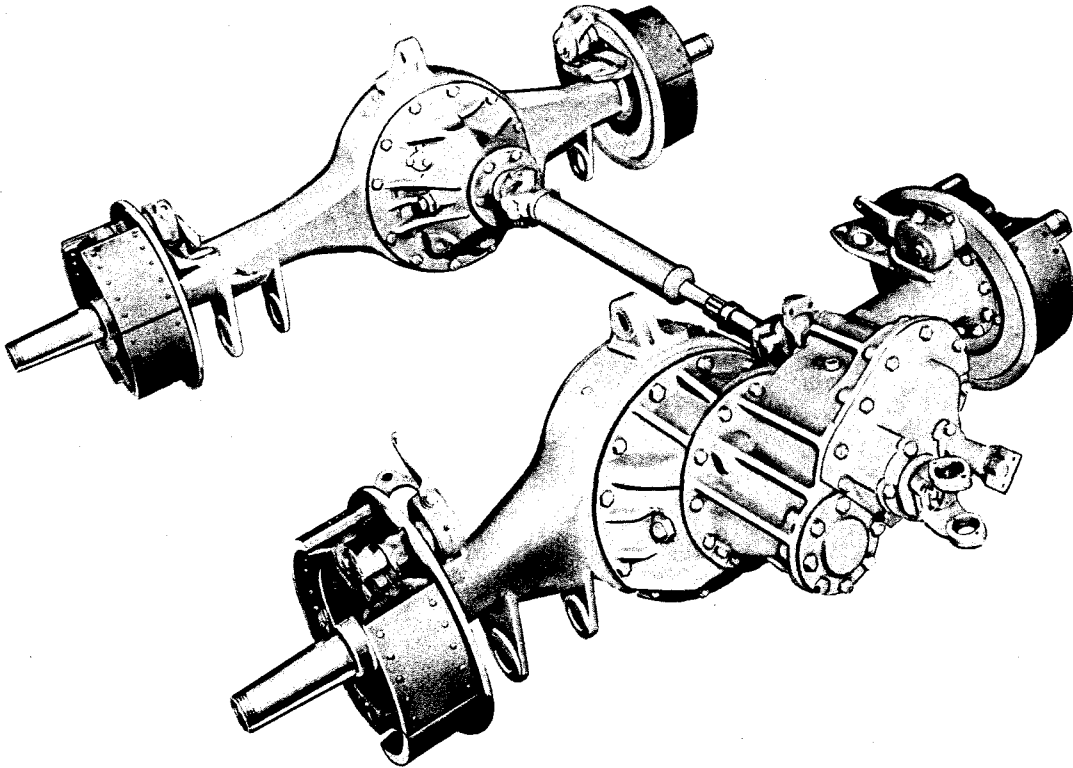


Fig. 71. Model 32M Tandem Drive Axle Assembly

The Eaton "M" Series Tandem Drive Axles consist of two axle units coupled by a single propeller shaft and a power divider unit. This single combination drive offers inter-axle differentiation for easier steering and better roadability. The design prevents axle fight and permits freer rolling for greater economy.

Descriptions and Overhaul instructions for the "M" Series Tandem Axles are divided into major sections:

- 1.** Model 22M, 28M, 32M and 36M Axles.
- 2.** Model 50M Axles.



TRUCK AXLES

"M" series tandem drive axles

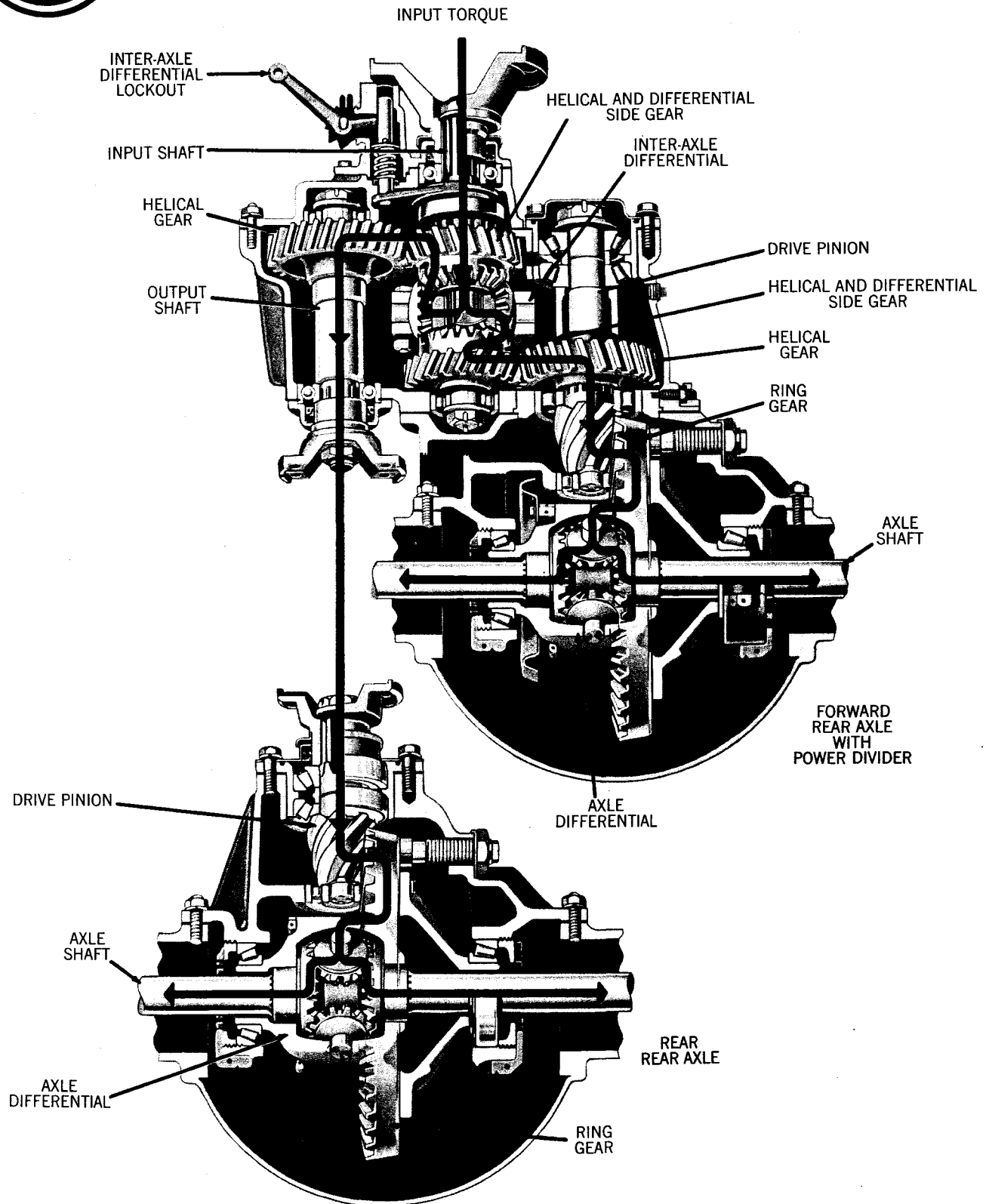


Fig. 72. Power Flow Through Model 32M Tandem Drive Axle

► MODEL 22M, 28M, 32M and 36M AXLES

MODEL DIFFERENCES. These four basic "M" Series Tandem Drive Axles are basically the same design. As the "M" Series Axles are changed to accommodate heavier loads, the model number is changed to designate load capacity variations of the axle series. The higher the model number, the heavier the load the axle will carry.

OPERATION. The Power Divider unit equally distributes power from the vehicle transmission to both the forward and rear rear axles. The inter-axle differential unit (mounted on the input shaft) operates the same as a conventional axle differential, providing differential action between the forward rear axle and the rear rear axle. The differential in each drive axle provides differential action for its respective wheels.

The forward rear axles of these tandem axles are single reduction units combined with the Power Divider. Two gear reductions are incorporated in the forward rear axle. One is obtained through helical gears mounted on the power divider input shaft and the drive pinion. Second reduction is obtained through the conventional ring gear and drive pinion.

The rear rear axles of these tandem axles are single reduction units, similar to the standard Eaton Single Reduction Axles. The rear rear axle in combination with the power divider (mounted on forward rear axle) provide two gear reductions. One is obtained through two helical gears (in power divider). Second reduction is obtained through the ring gear and drive pinion mounted in the rear rear axle.

POWER FLOW. Power flow through Model 22M, 28M, 32M and 36M Tandem Drive Axles is basically the same. Figure 72 illustrates power flow for Model 32M Tandem Drive Axles. Input torque from vehicle transmission is transmitted to the input shaft and to the splined inter-axle differential spider. At this point, torque is transmitted through the inter-axle differential to forward and rear rear axles as follows:

- (1). Power is transferred from spider through side pinions, "floating" helical-side gear (rear gear on input shaft) and drive pinion helical gear to drive pinion and ring gear of the forward rear axle.
- (2). Power is transferred from spider through side pinions, "floating" helical-side gear (front gear on input shaft), output shaft helical gear, output shaft and inter-axle propeller shaft to the drive pinion and ring gear of the rear rear axle.

Thus, by using the inter-axle differential as a power distribution point for the two axles, differential action is provided between the forward and the rear rear axles.

When the inter-axle differential is not in operation (lockout mechanism engaged . . . refer to lockout mechanism description on page 38), the input shaft, input shaft "floating" helical-side gears and inter-axle differential rotate as one assembly. Power is then transferred to both axles without inter-axle differential action. The forward axle drive pinion is driven from input shaft rear "floating" helical-side gear to drive pinion helical gear. The rear rear axle drive pinion is driven from the input shaft front "floating" helical-side gear, through the output shaft helical gear, output shaft and inter-axle propeller shaft.

► MODEL 50M AXLES

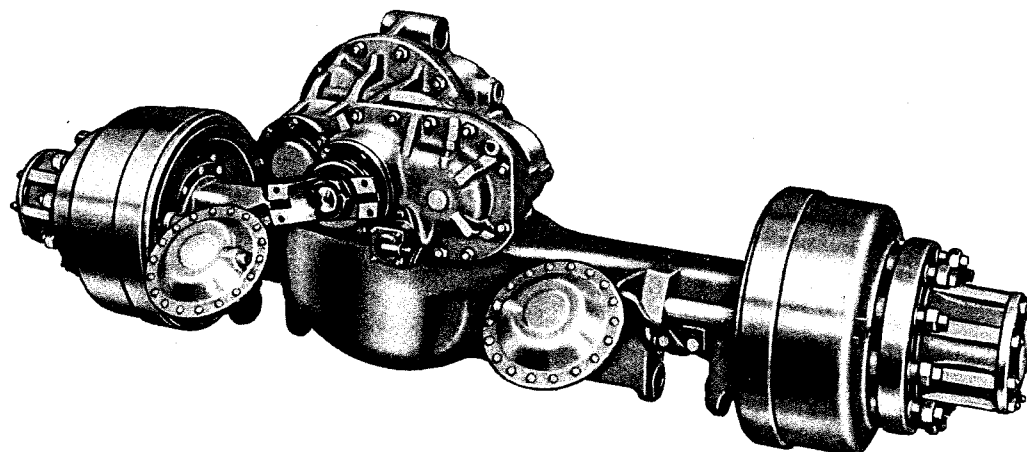


Fig. 73. Forward Rear Axle Assembly for Model 50M Tandem Drive Axle

NOTE: Model 50M tandem axle is a modification of Model 42M. Instructions for both axles are essentially the same.

Model 50M Tandem Drive Axles consist of three units. Two knee-mounted, double reduction axle units and a power divider. The power divider is mounted on the forward rear axle (see figure 73). An inter-axle propeller shaft connects the rear rear axle to the power divider.

OPERATION. The tandem assembly is designed to provide three reductions for each of the axle units. The first reduction is obtained through helical gears in the power divider. The second reduction is through the drive pinion and ring gear. The third reduction is through the herringbone pinion (integral part of countershaft)

and herringbone gear. Operation of the inter-axle differential and power flow through the power divider for Model 50M axle is the same as Model 32M, shown in figure 72. Power flow from power divider through the basic double reduction axles is as follows:

On the forward rear axle, torque is transmitted from drive pinion through the ring gear, herringbone pinion (integral with countershaft), herringbone gear, axle differential and axle shafts to the wheels.

On the rear rear axle, torque is transmitted from the power divider output shaft through the inter-axle propeller shaft, drive pinion, ring gear, herringbone pinion (integral with countershaft), herringbone gear, axle differential and axle shafts to the wheels.

LOCKOUT MECHANISM

Model 22M, 28M, 32M, 36M and 50M axles

A lockout mechanism is used on the forward rear axle to lock out the inter-axle differential and provide maximum traction when road conditions are unfavorable.

The lockout mechanism consists of a sliding clutch (mounted on the power divider input shaft), shift fork and push rod, and control system. The shift fork may be operated by an air-operated shift cylinder, vacuum-operated control, or mechanically-operated control.

When the lockout mechanism is engaged by the driver, the sliding clutch engages the helical-side gear and locks out the inter-axle differential action. This provides

a positive drive to both axles.

When the lockout control is released, a spring on the shift fork push rod operates to automatically disengage the sliding clutch from the helical-side gear, and inter-axle differential action is again restored.

The lockout control should be placed in the locked-out position, only at slow speeds. Never move control while wheels are slipping. Continuous unnecessary use of lockout must be avoided, as such use could cause abnormal tire wear.

► MODEL 22M, 28M, 32M and 36M AXLES

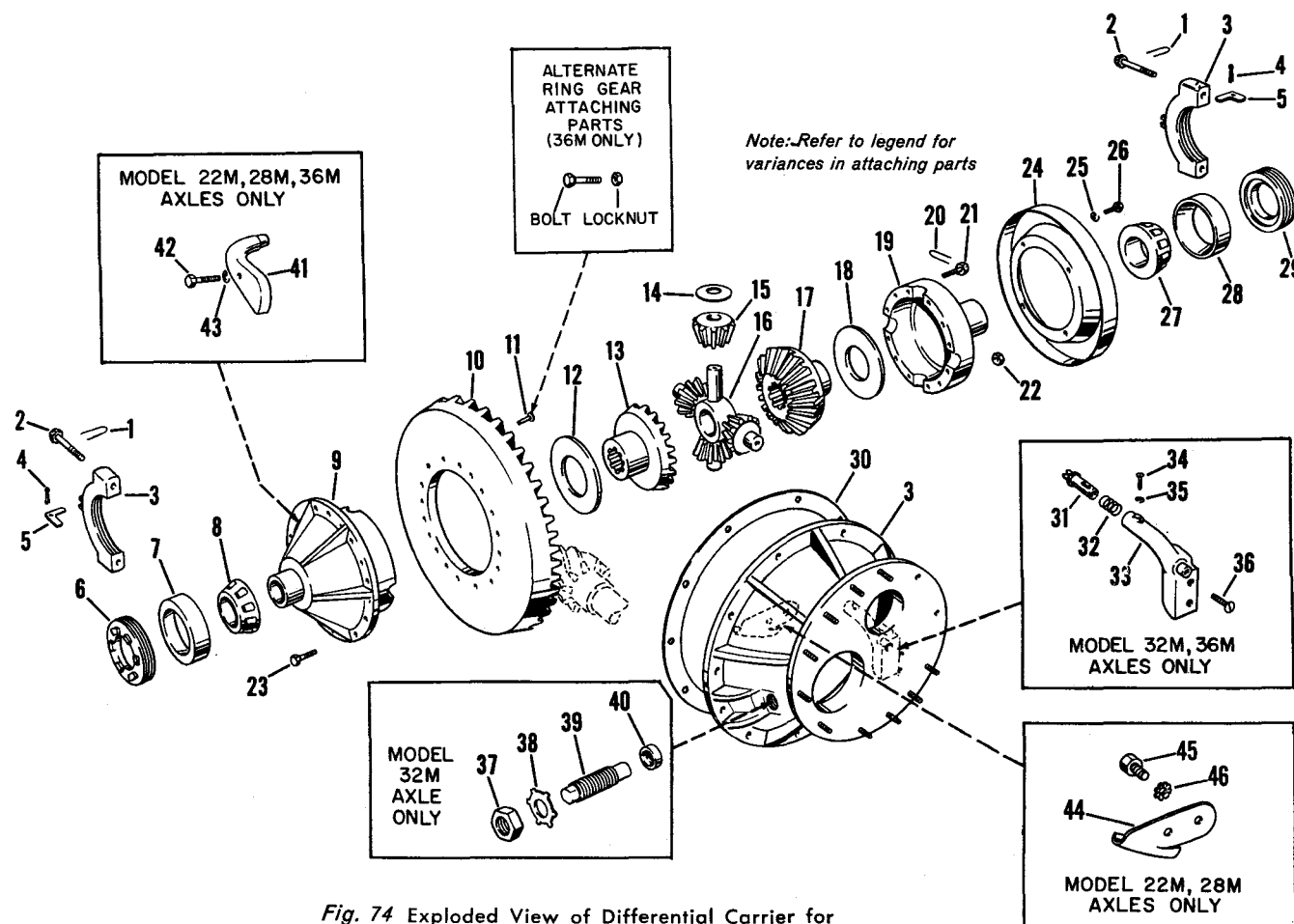


Fig. 74 Exploded View of Differential Carrier for
Model 22M, 28M, 32M and 36M Tandem Drive Axles

RH — Right-hand LH — Left-hand

Right and Left Hand is determined by standing at rear of vehicle
and facing rear of axle (as installed in vehicle).

- | | | |
|--|--|---|
| 1. Lockwire | 15. Side pinion | 31. Differential carrier oil feeder (32M, 36M) |
| 2. Cap screws | 16. Spider | 32. Compression spring (32M, 36M) |
| 3. Differential carrier and bearing caps (matched parts) | 17. Side gear (LH) | 33. Oil feeder bracket (32M, 36M) |
| 4. Cotter pin | 18. Side gear thrust washer (LH) | 34. Locating screw (32M, 36M) |
| 5. Adjuster lock | 19. Differential case (plain half) | 35. Lockwasher (32M, 36M) |
| 6. Differential bearing adjuster (RH) | 20. Lockwire (32M, 36M) | 36. Machine screw (32M, 36M) |
| 7. Differential bearing cup (RH) | 21. Cap screw (32M, 36M) | 37. Nut (32M) |
| 8. Differential bearing cone (RH) | 22. Locknut (22M, 28M) | 38. Lock (32M) |
| 9. Differential case (flanged half) | 23. Bolt (22M, 28M) | 39. Adjusting screw (32M) |
| 10. Ring gear and drive pinion (matched set) | 24. Oil collector drum (32M, 36M) | 40. Ring gear thrust block (32M) |
| 11. Ring gear rivet | 25. Lockwasher (32M) | 41. Differential oil lubricator (22M, 28M, 36M) |
| 12. Side gear thrust washer (RH) | 26. Oil collector drum cap screw (32M) | 42. Cap screw (22M, 28M, 36M) |
| 13. Side gear (RH) | 27. Differential bearing cone (LH) | 43. Lockwasher (22M, 28M, 36M) |
| 14. Side pinion thrust washer | 28. Differential bearing cup (LH) | 44. Oil pickup trough (22M, 28M) |
| | 29. Differential bearing adjuster (LH) | 45. Cap screw (22M, 28M) |
| | 30. Carrier gasket | 46. Lockwasher (22M, 28M) |



TRUCK AXLES

"M" series tandem drive axles

Model 22M, 28M and 32M Axles

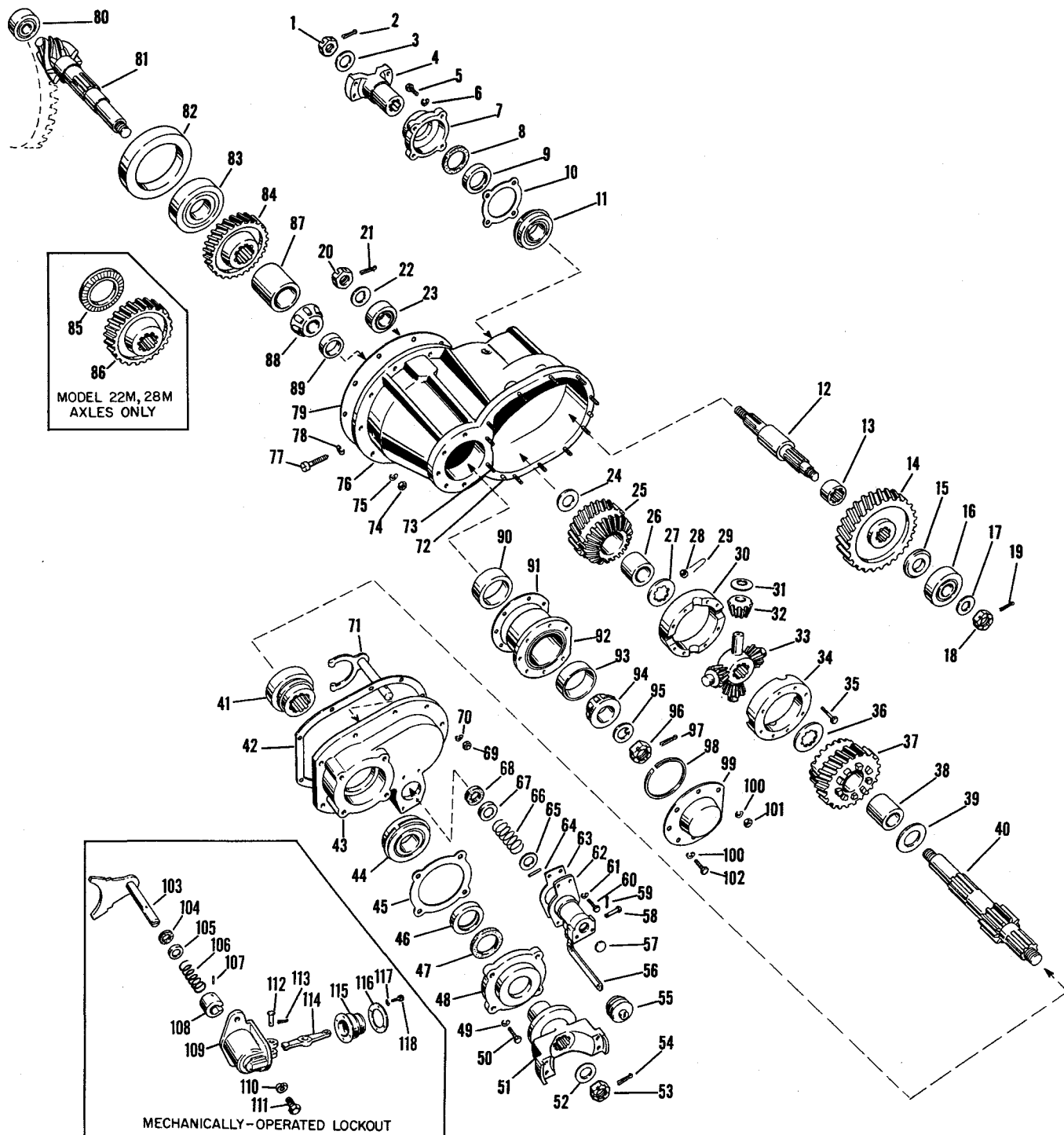


Fig. 75. Exploded View of Power Divider for
Model 22M, 28M and 32M Tandem Drive Axles
(See fig. 114 for 36M)

Model 22M, 28M and 32M Axles

LEGEND FOR FIGURE 75

Reference to "FRONT" indicates the input companion flange side of power divider. "REAR" indicates the differential carrier side.

- | | | |
|--|--|--|
| 1. Flange nut | 34. Inter-axle differential case (female half, front) | 67. Seal retainer |
| 2. Cotter pin | 35. Bolt | 68. Felt seal |
| 3. Flat washer | 36. Differential spider splined washer (front) | 69. Stud nut |
| 4. Output companion flange | 37. Helical and differential side gear (front) | 70. Lockwasher |
| 5. Cap screw | 38. Helical and differential side gear bushing (front, long) | 71. Shift fork and push rod |
| 6. Lockwasher | 39. Input shaft spacer washer | 72. Dowel pins |
| 7. Output shaft bearing cover (rear) | 40. Input shaft | 73. Stud |
| 8. Felt seal | 41. Sliding clutch | 74. Stud nut |
| 9. Oil seal | 42. Power divider case cover gasket | 75. Lockwasher |
| 10. Bearing cover gasket | 43. Power divider case cover | 76. Power divider case |
| 11. Output shaft bearing (rear) | 44. Input shaft bearing (front) | 77. Bearing sleeve set screw |
| 12. Output shaft | 45. Bearing cover gasket | 78. Lockwasher |
| 13. Helical gear spacer | 46. Oil seal | 79. Power divider case gasket |
| 14. Output shaft helical gear | 47. Felt seal | 80. Pinion pilot bearing |
| 15. Front bearing spacer washer | 48. Input shaft bearing cover (front) | 81. Drive pinion and ring gear (matched set) |
| 16. Output shaft bearing (front) | 49. Lockwasher | 82. Inner bearing sleeve |
| 17. "D" washer (32M) | 50. Cap screw | 83. Pinion bearing (inner) |
| 18. Output shaft nut (front) | 51. Input companion flange | 84. Helical gear (32M) |
| 19. Cotter pin | 52. Flat washer | 85. Helical gear seal (22M, 28M) |
| 20. Input shaft nut (inner) | 53. Flange nut | 86. Helical gear (22M, 28M) |
| 21. Cotter pin | 54. Cotter pin | 87. Pinion spacer (long) |
| 22. "D" washer | 55. Shift lever boot | 88. Pinion bearing cone (inner) |
| 23. Input shaft bearing (rear) | 56. Shift lever | 89. Pinion bearing spacer |
| 24. Rear bearing spacer washer | 57. Expansion plug | 90. Pinion bearing cup (inner) |
| 25. Helical and differential side gear (rear) | 58. Shift lever clevis pin | 91. Shims |
| 26. Helical and differential side gear bushing (rear, short) | 59. Cotter pin | 92. Pinion bearing cage |
| 27. Differential spider splined washer (rear) | 60. Cap screw | 93. Pinion bearing cup (outer) |
| 28. Nut | 61. Lockwasher | 94. Pinion bearing cone (outer) |
| 29. Lockwire | 62. Shift lever bracket | 95. Tongued washer |
| 30. Inter-axle differential case (male half, rear) | 63. Shift lever bracket gasket | 96. Pinion nut |
| 31. Side pinion thrust washer | 64. Retainer washer pin | 97. Cotter pin |
| 32. Side pinion | 65. Retainer washer | 98. Cork seal |
| 33. Spider | 66. Compression spring | 99. Pinion bearing cage cover |
| | | 100. Lockwasher |
| | | 101. Stud nut |
| | | 102. Cap screw |

LEGEND FOR INSERT

(Mechanically-Operated Lockout)

- | | | |
|------------------------------|-----------------------------|-----------------------|
| 103. Shift fork and push rod | 109. Shift lever bracket | 115. Shift lever boot |
| 104. Felt seal | 110. Lockwasher | 116. Boot retainer |
| 105. Seal retainer | 111. Cap screw | 117. Lockwasher |
| 106. Compression spring | 112. Shift lever clevis pin | 118. Machine screw |
| 107. Rod bushing pin | 113. Cotter pin | |
| 108. Rod bushing | 114. Shift lever | |



"M" series tandem drive axles

► REAR REAR AXLE OVERHAUL Model 22M, 28M, 32M and 36M Axles

The rear rear axle unit of these "M" Series Tandem Drive Axles is a single reduction unit. Instructions for

this axle are contained in the "Single Reduction Axle" Section of this manual.

► FORWARD REAR AXLE OVERHAUL Model 22M, 28M, 32M and 36M Axles

► removal and disassembly of differential carrier and power divider

remove differential carrier and power divider assembly from axle housing

1. Drain lubricant. Disconnect propeller shafts and remove axle shafts.
2. Disconnect lockout shift lever connections.

3. Remove differential carrier to axle housing cap screws (or stud nuts) and lockwashers. Remove differential carrier and power divider assembly from axle housing. Discard carrier gasket.

loosen drive pinion, input flange and output flange nuts

If preliminary inspection reveals that ring gear and drive pinion are satisfactory, check backlash with dial indicator and take a tooth contact pattern for reference and easier adjustment in reassembly.

1. Place differential carrier and power divider assembly in repair stand.
2. Remove pinion bearing cage cover nuts, cap screws and lockwashers, then lift off cage cover. Remove and discard cork seal. Remove cotter pin from drive pinion nut. Hold input and output companion flanges and loosen pinion nut. *Do not remove pinion nut at this time.*
3. Remove cotter pin from input flange nut. Hold input companion flange and loosen nut. *Do not remove flange nut at this time.*
4. Remove cotter pin from output flange nut. Hold output companion flange and loosen nut. *Do not remove flange nut at this time.*

remove differential from carrier

1. Punch mark differential bearing caps and carrier for correct location in reassembly. Also punch mark differential bearing adjusters for correct location of adjuster locks.
2. Cut lockwires and remove differential bearing cap screws, caps, adjusters, locks and bearing cups from both sides of differential.

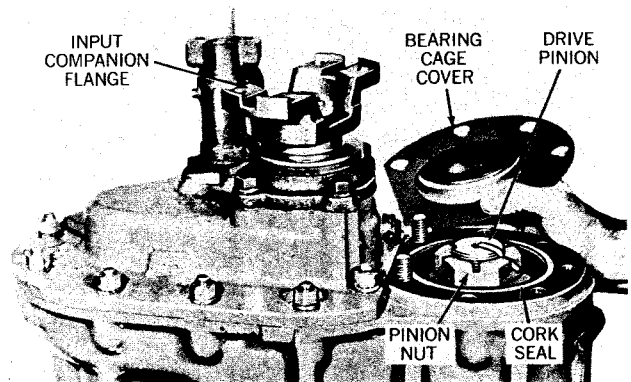


Fig. 76.

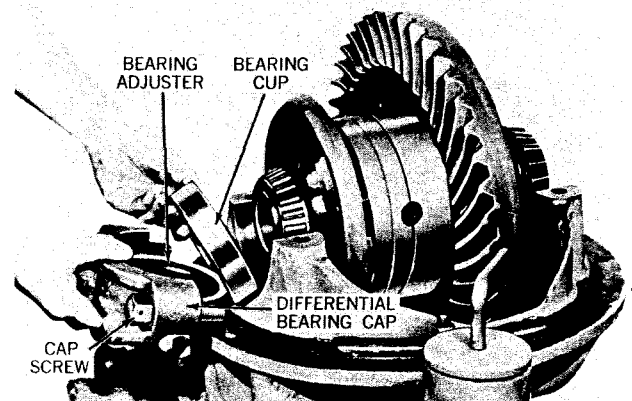


Fig. 77.

remove differential from carrier (continued)

Model 22M, 28M and 36M Axles

- 3.** Remove differential assembly from carrier (see figs. 78 and 79).

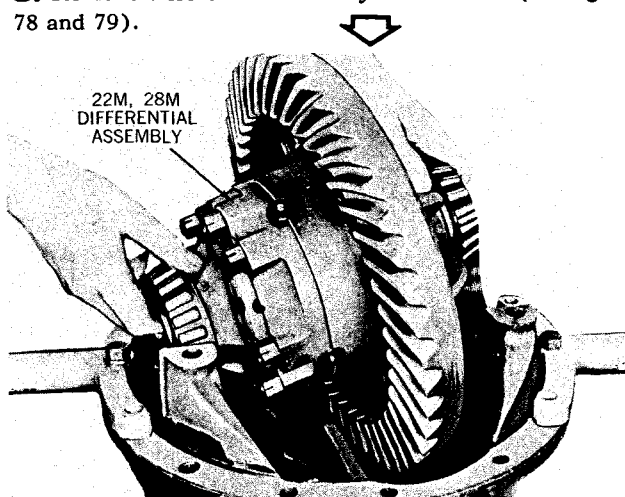


Fig. 78.

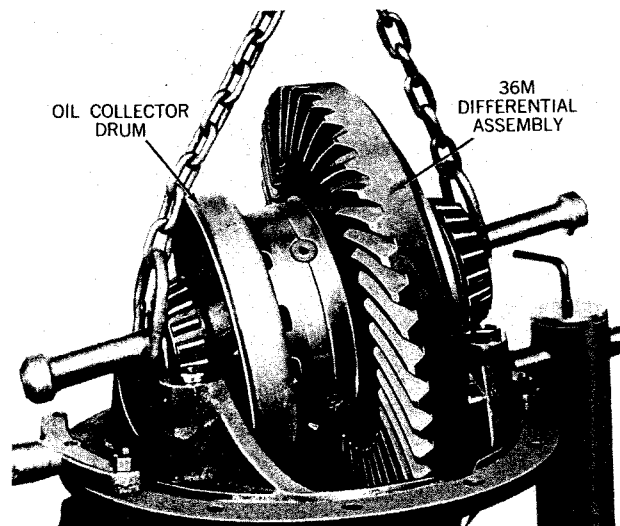


Fig. 79.

Model 32M Axles

- 4.** Straighten ear of lock then loosen nut. Loosen thrust block adjusting screw to move thrust block away from ring gear and permit removal of differential assembly.

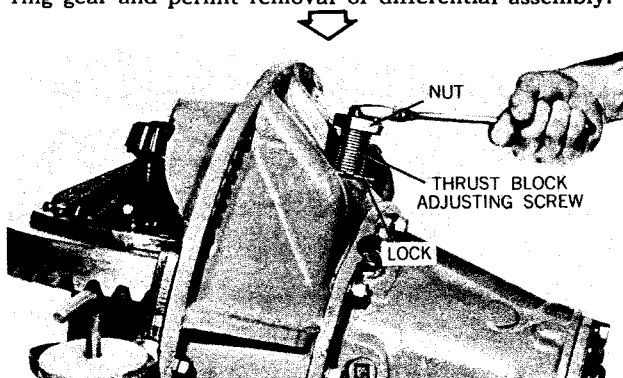


Fig. 80.

- 5.** Remove oil collector drum to differential case cap screws and lockwashers. Remove drum after differential is removed from carrier.

- 6.** Tilt differential assembly to move ring gear away from pinion then lift differential assembly from carrier (see fig. 81).

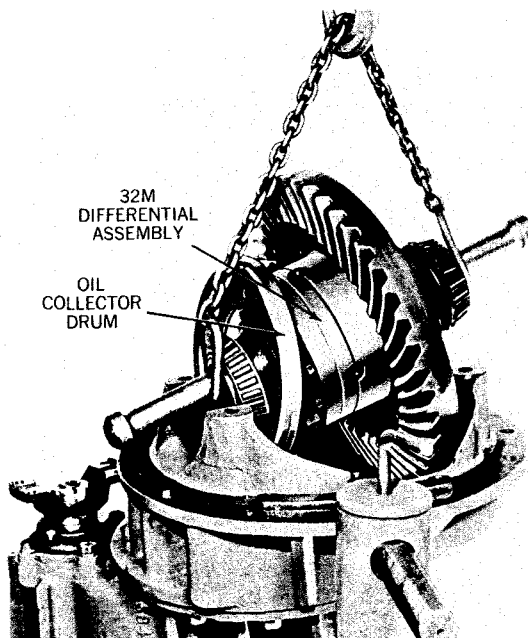


Fig. 81.

remove power divider from differential carrier

On Model 22M, 28M and 32M Axles, the differential must be removed from carrier before removing the power divider. On Model 36M Axles, the power divider may be removed with differential assembled in carrier.

- 1.** Remove power divider case to differential carrier stud nuts and lockwashers, then remove power divider from carrier. Discard divider case gasket.



TRUCK AXLES

"M" series tandem drive axles

► disassembly of power divider Model 36M Axles

The power divider assembly for Model 36M Axle is the same as Model 50M Axle. Refer to Model 50M Axle Power Divider Instructions (page 63) for information.

► disassembly of power divider Model 22M, 28M and 32M Axles

Instructions begin with disassembly of power divider, followed by disassembly of subassemblies. Reference to "front" indicates the input companion flange side of power divider. "Rear" indicates the differential carrier side.

disassemble power divider into subassemblies

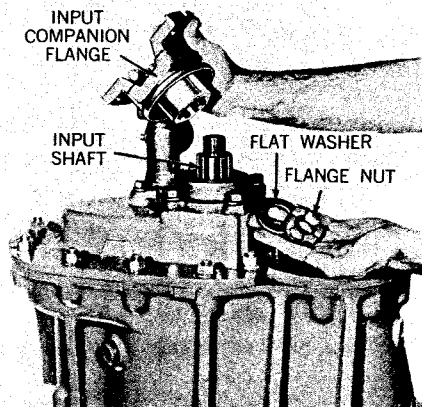


Fig. 82.

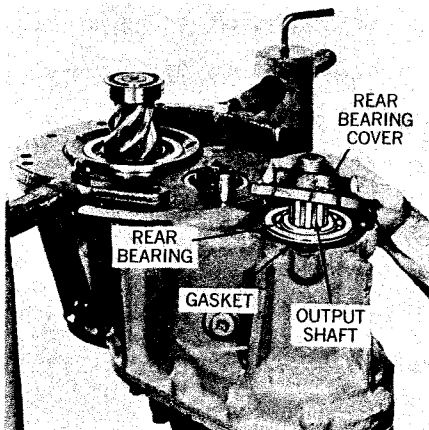


Fig. 84.

1. Mount power divider in a repair stand that will permit rotation of the entire assembly for easier handling during reassembly.

2. Remove loosened input flange nut and flat washer. Remove flange.

3. Loosen cap screws on input shaft front bearing cover. *Do not remove cap screws or cover at this time.* Remove power divider case cover to case stud nuts. Using suitable bearing puller, grip front bearing cover with puller legs and position puller screw against input shaft. Pull bearing cover and case cover assembly from case. Discard case cover gasket.

4. Remove loosened output flange nut and flat washer. Remove flange.

5. Remove cap screws and lockwashers from output shaft rear bearing cover. Remove cover assembly and gasket from divider case. Discard gasket. Remove oil seal and felt seal from bearing cover.

6. Working at rear end of output shaft, drive shaft out of rear bearing. Lift output shaft assembly out of divider case, then remove rear bearing from divider case.

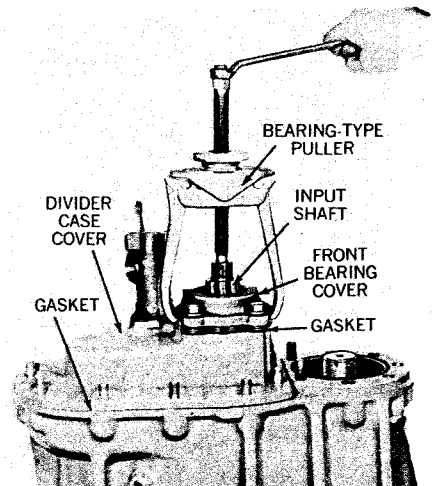


Fig. 83.

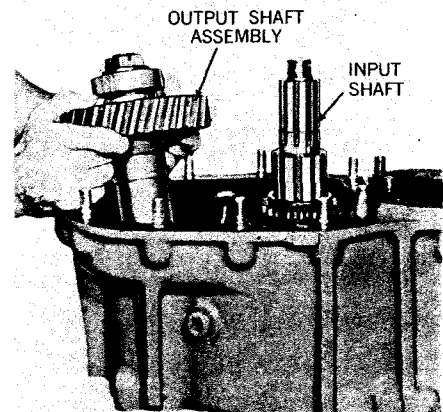


Fig. 85.

Model 22M, 28M and 32M Axles

disassemble power divider into subassemblies (continued)



Fig. 86.

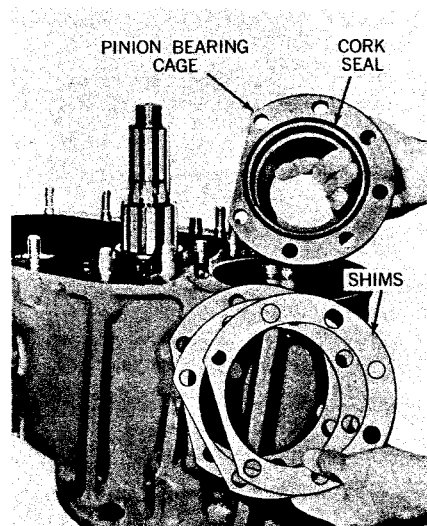


Fig. 88.

7. Remove inner bearing sleeve set screw and lockwasher from divider case. This set screw holds drive pinion inner bearing sleeve in place.

8. Remove loosened drive pinion nut and tongued washer. Drive pinion assembly out rear of divider case. Remove outer bearing cone from bearing cage.

9. Remove pinion bearing cage and shims from divider case. Note quantity and size of shims under cage flange for easier adjustment during reassembly. If replacement is necessary, remove bearing cups from cage.

10. Remove cotter pin from input shaft inner nut. Temporarily place companion flange on input shaft. Hold flange and remove nut and "D" washer from input shaft.

11. Place power divider case in press with front helical gear supported then press on rear end of input shaft until shaft end clears rear bearing. Remove input shaft assembly from divider case. Remove rear bearing from divider case.

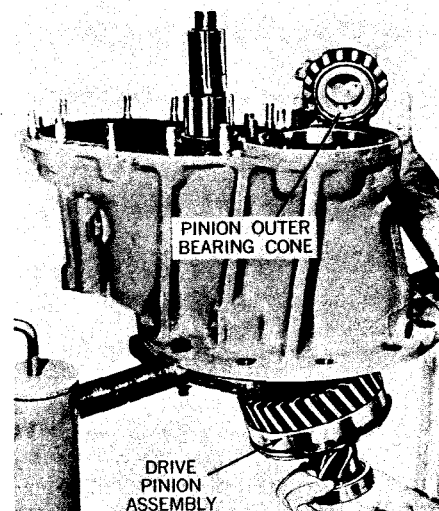


Fig. 87.

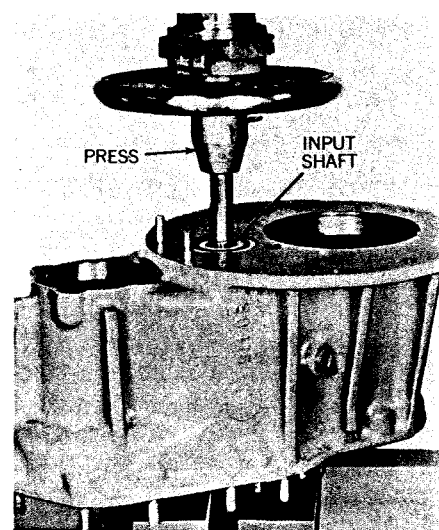


Fig. 89.

disassemble input shaft

1. Lift rear bearing spacer washer and rear helical-side gear off input shaft.

2. Place input shaft assembly in press with splined end down and input shaft spacer washer resting on press plate. Press input shaft out of component parts.

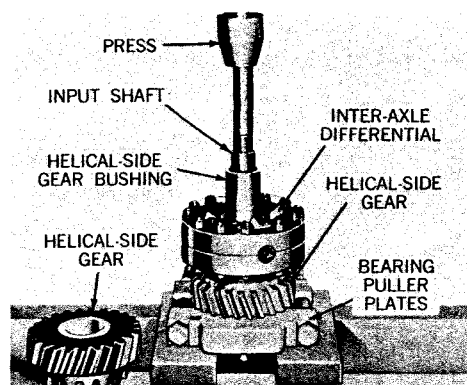


Fig. 90.



TRUCK AXLES

"M" series tandem drive axles

Model 22M, 28M and 32M Axles

disassemble inter-axle differential

1. Punch mark differential cases for correct location in reassembly. Cut lockwire and remove nuts and bolts

holding cases together. Separate cases then remove spider, side pinions and thrust washers.

disassemble drive pinion

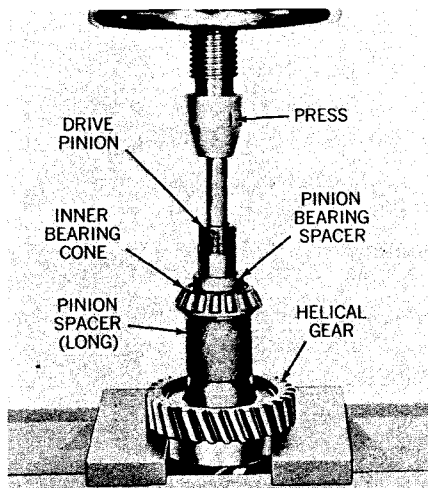


Fig. 91.

1. Remove sleeve from inner bearing. Place drive pinion assembly in arbor press with teeth down and disassemble in two steps as described below.

2. Place press support plates under helical gear then press pinion out of pinion bearing spacer, inner bearing cone, long pinion spacer and helical gear.

3. Place bearing puller plates between pinion teeth and inner race of inner bearing then press pinion out of inner bearing. Remove pilot bearing from pinion using press or suitable puller.

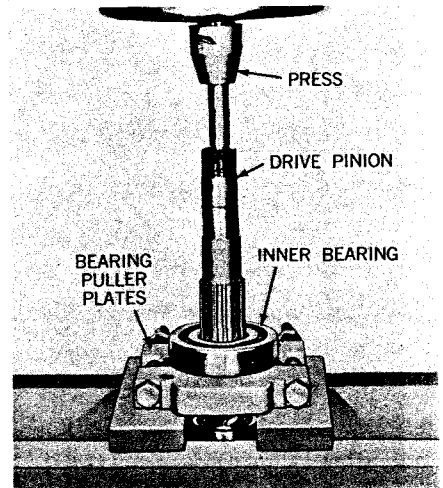


Fig. 92.

disassemble output shaft

1. Remove cotter pin from output shaft front nut. Temporarily install companion flange on rear end of output shaft. Hold flange and loosen output shaft front nut. Remove nut and "D" washer. ("D" washer is only used on 32M Axle.)

2. Place output shaft assembly in press with splined end down and helical gear resting on press plate. Press shaft through front bearing, spacer washer and helical gear. Remove helical gear spacer.

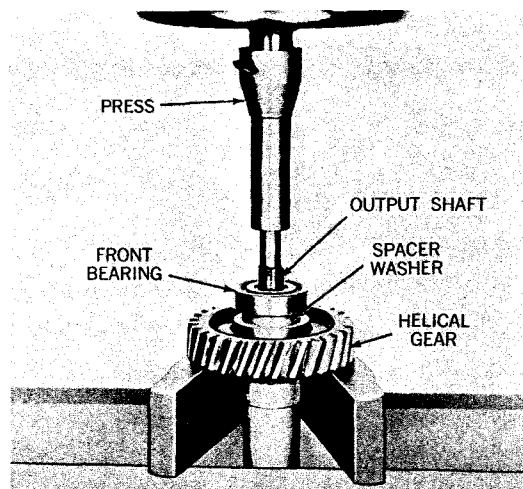


Fig. 93.

disassemble power divider case cover (with vacuum-operated lockout)

Either vacuum-operated, air-operated or mechanically-operated lockout may be used on the "M" Series Axles. Refer to page 65 for instructions on air-operated lockout. The following instructions are for vacuum-operated lockout. Mechanically-operated lockout varies slightly from vacuum-operated lockout. Refer to insert in figure 75 for components.

1. Remove loosened cap screws, lockwashers and front bearing cover assembly from divider case cover. Discard bearing cover gasket. Remove oil seal and felt seal from bearing cover.

2. Remove sliding clutch and input shaft front bearing from case cover.

Model 22M, 28M and 32M Axles

disassemble power divider case cover (continued)

3. Push back shift lever boot. Remove cotter pin and clevis pin, then remove shift lever. Remove cap screws, lockwashers and shift lever bracket from case cover. Discard bracket gasket.

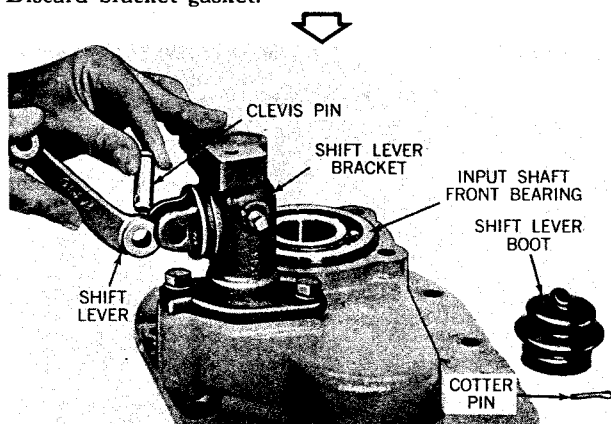


Fig. 94.

4. Depress compression spring then remove pin, retainer washer and compression spring from push rod. Withdraw shift fork and push rod from case cover. Remove seal retainer and felt seal from case cover.

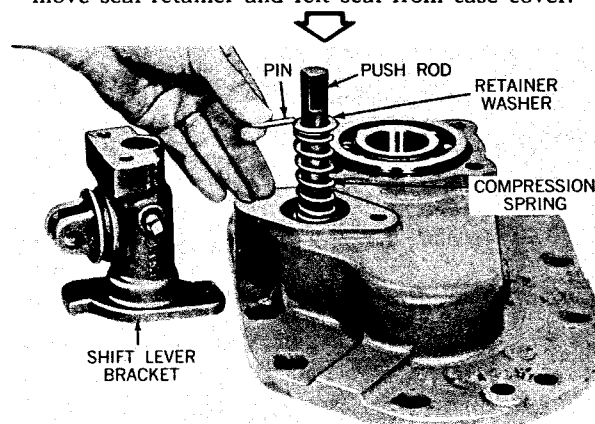


Fig. 95.

► disassembly of axle differential

disassemble axle differential Model 22M and 28M Axles

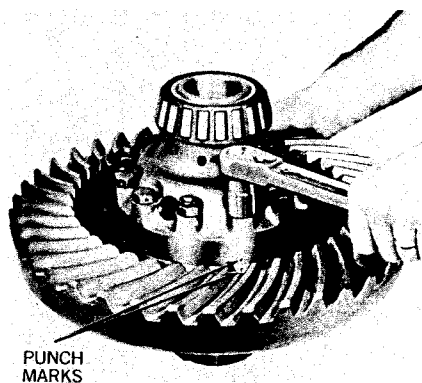


Fig. 96.

1. Punch mark differential cases for correct location in re-assembly. Remove differential case locknuts and bolts. Lift off plain differential case.

2. Remove left-hand side gear and thrust washer then lift out differential spider, side pinion and thrust washer assembly. Remove right-hand side gear and thrust washer from flanged differential case.

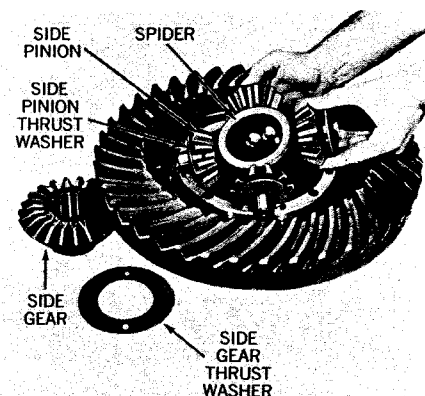


Fig. 97.

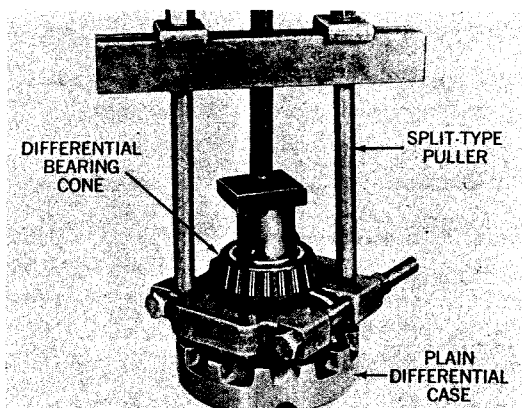


Fig. 98.

3. Remove cap screw, lock-washer and differential lubricator from flanged differential case.

4. Remove bearing cones from differential cases using split-type bearing puller. To remove ring gear from flanged differential case, drill off the flat head (on ring gear side) of rivets and drive out rivets.



TRUCK AXLES

"M" series tandem drive axles

Model 32M and 36M Axles

disassemble axle differential Model 32M Axles

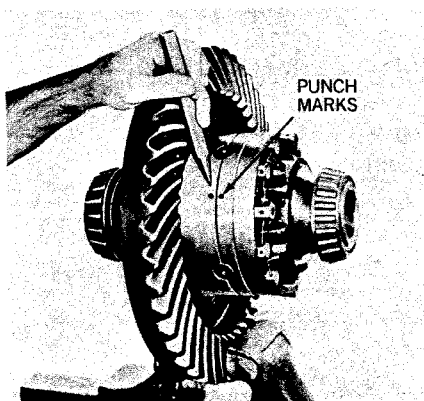


Fig. 99.

1. Oil collector drum was removed during removal of differential from carrier (see page 43).

2. Punch mark differential cases for correct location in reassembly. Cut lockwire and remove differential case cap screws. Lift off plain differential case.

3. Remove left-hand side gear and thrust washer then lift out differential spider, side pinion and thrust washer assembly. Remove right-hand side gear and thrust washer from flanged differential case.

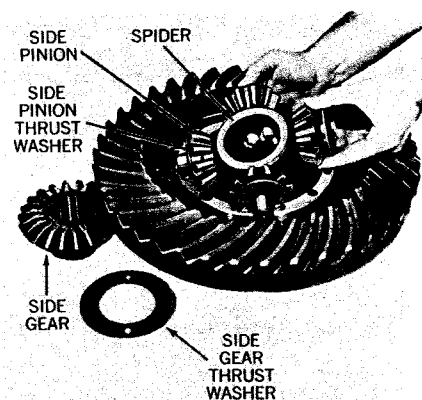


Fig. 100.

4. Remove bearing cones from differential cases using split-type bearing puller. To remove ring gear from flanged differential case, drill off the flat head (on ring gear side) of rivets and drive out rivets.

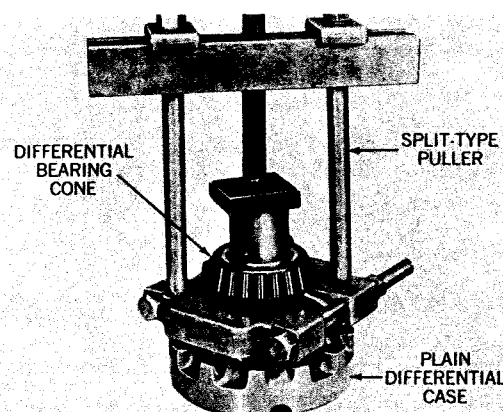


Fig. 101.

disassemble axle differential Model 36M Axles

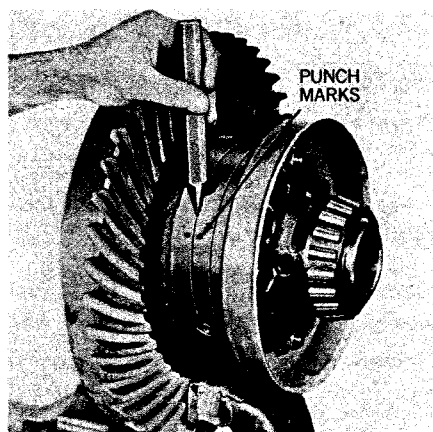


Fig. 102.

1. Punch mark differential cases for correct location in reassembly. Cut lockwire and remove differential case cap screws. Lift off oil collector drum and plain differential case.

2. Refer to figure 100. Remove left-hand side gear and thrust washer then lift out differential spider, side pinion and thrust washer assembly. Remove right-hand side gear and thrust washer from flanged differential case.

3. Remove cap screw, lockwasher and differential lubricator from flanged differential case.

4. Refer to figure 101. Remove bearing cones from differential cases using split-type bearing puller. To remove ring gear from flanged differential case, drill off the flat head (on ring gear side) of rivets and drive out rivets.

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.

► reassembly of power divider Model 36M Axles

The power divider assembly for Model 36M Axle is the same as Model 50M Axle. Refer to Model 50M Axle Power Divider Instructions (page 66) for information.

For Torque Requirements . . . refer to page 122.

► reassembly of power divider Model 22M, 28M and 32M Axles

Partially reassemble shafts and case covers before re-assembling power divider case.

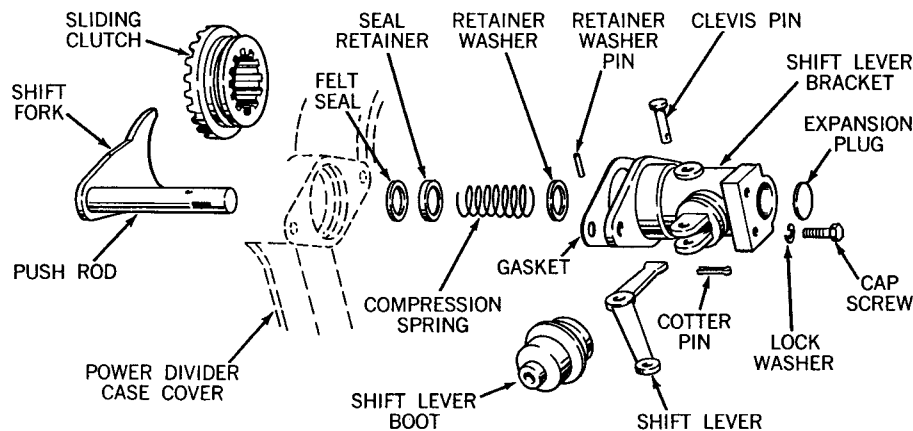


Fig. 103. Exploded View of Vacuum-Operated Lockout

assemble power divider case cover (with vacuum-operated lockout)

Either vacuum-operated, air-operated or mechanically-operated lockout may be used on the "M" Series Axles. Refer to page 66 for instructions covering air-operated lockout. The following instructions are for vacuum-operated lockout. Mechanically-operated lockout varies slightly from vacuum-operated lockout. Refer to insert in figure 75 for components.

1. Install input shaft front bearing in divider case cover.
2. Place felt seal and seal retainer in recess in case cover. Insert push rod through case cover opening.

Place compression spring and retainer washer on push rod, compress spring and install retainer washer pin. Coat spring and retainer washer with grease.

3. Install shift lever bracket and gasket over push rod and install cap screws and lockwashers.
4. Position shift lever on bracket engaging end of lever with slot in push rod. Install clevis pin and cotter pin to connect lever to bracket.
5. Place boot on shift lever and bracket.
6. Depress shift lever and position sliding clutch in case cover, engaging shift fork in clutch grooves.



TRUCK AXLES

"M" series tandem drive axles

Model 22M, 28M and 32M Axles

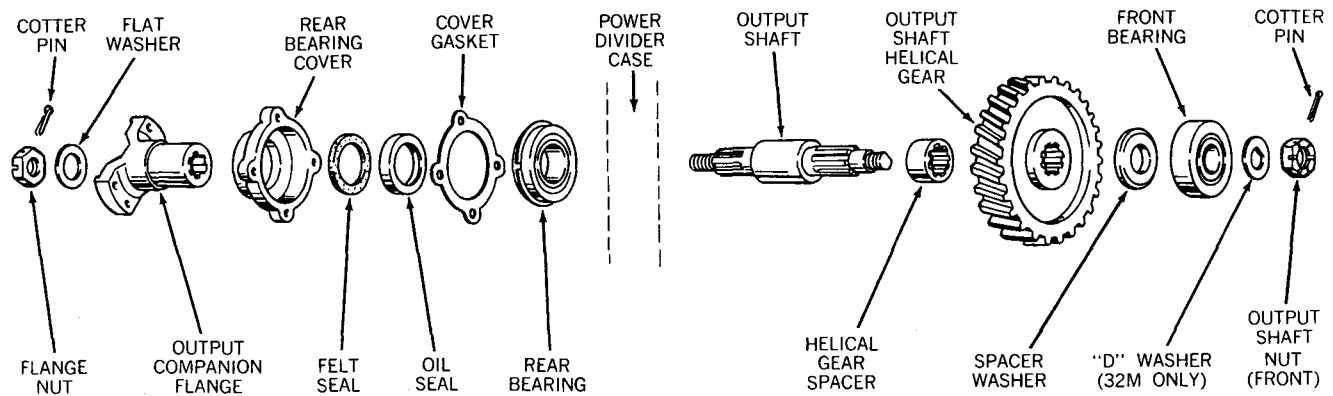


Fig. 104. Exploded View of Output Shaft

assemble output shaft

1. Press helical gear spacer on front end of output shaft. Then press helical gear, spacer washer and front bearing on output shaft.
2. Temporarily place companion flange on rear end of output shaft. Place output shaft in vise with rear end

down, gripping flange in vise jaws.

3. Install "D" washer (used only on Model 32M Axle) on output shaft. Install and tighten output shaft front nut to correct torque. Install cotter pin.

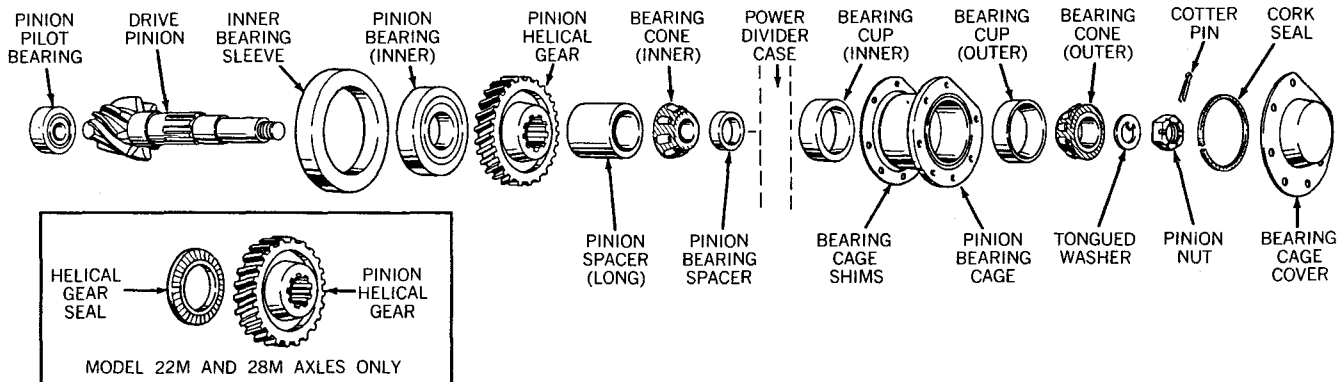


Fig. 105. Exploded View of Drive Pinion

assemble drive pinion

1. Press pilot bearing on drive pinion. Stake in four places (see fig. 106).
2. Lubricate and press inner bearing on drive pinion, positioning bevel side of bearing toward pinion teeth.
3. On Model 22M and 28M Axles, install oil seal in helical gear, positioning segment springs inside. Press

helical gear on drive pinion, placing seal towards inner bearing. On Model 32M Axles, press helical gear on drive pinion, positioning short hub toward inner bearing.

4. Press long pinion spacer on drive pinion. Press inner bearing cone on drive pinion.

Model 22M, 28M and 32M Axles

assemble drive pinion (continued)

5. If removed, press bearing cups in pinion bearing cage.

6. Lubricate pinion bearings. Temporarily place bearing cage, bearing spacer, outer bearing cone, tongued washer and nut on drive pinion. Tighten nut to correct torque. Rotate pinion bearing cage while tightening nut. Check pinion bearing pre-load adjustment. (Refer to "Adjustment" Section of this manual.)

7. With pinion bearings correctly adjusted, remove temporarily installed nut, tongued washer, outer bearing cone and bearing cage from pinion.

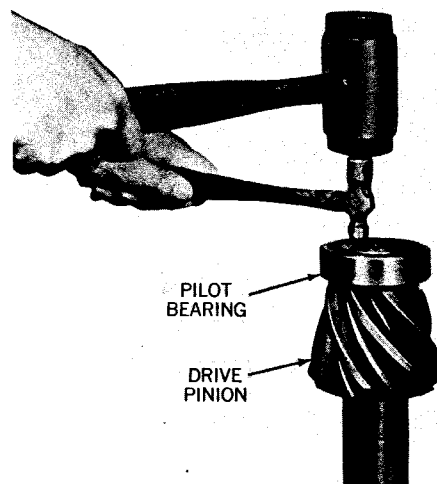


Fig. 106. Staking Pinion Pilot Bearing

For Torque Requirements . . . refer to page 122.

assemble inter-axle differential

Lubricate internal parts of inter-axle differential during reassembly.

1. Place side pinions and thrust washers on spider journals. Assemble spider assembly and case halves, aligning punch marks (made during disassembly). Install bolts and nuts to secure case halves. Tighten nuts to correct torque and lockwire.

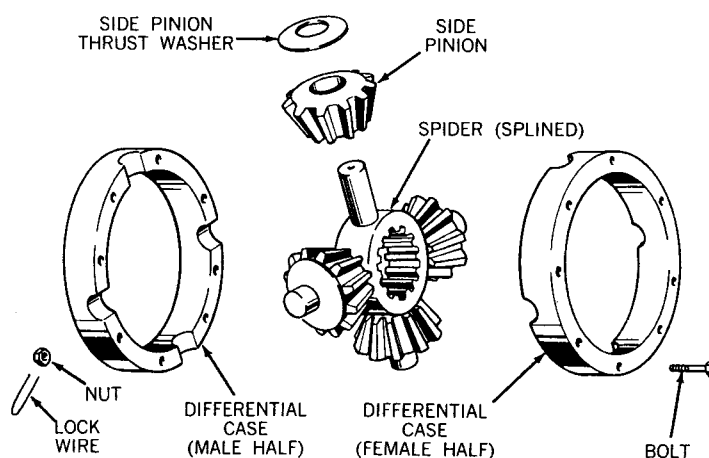


Fig. 107. Exploded View of Inter-Axle Differential



TRUCK AXLES

"M" series tandem drive axles

Model 22M, 28M and 32M Axles

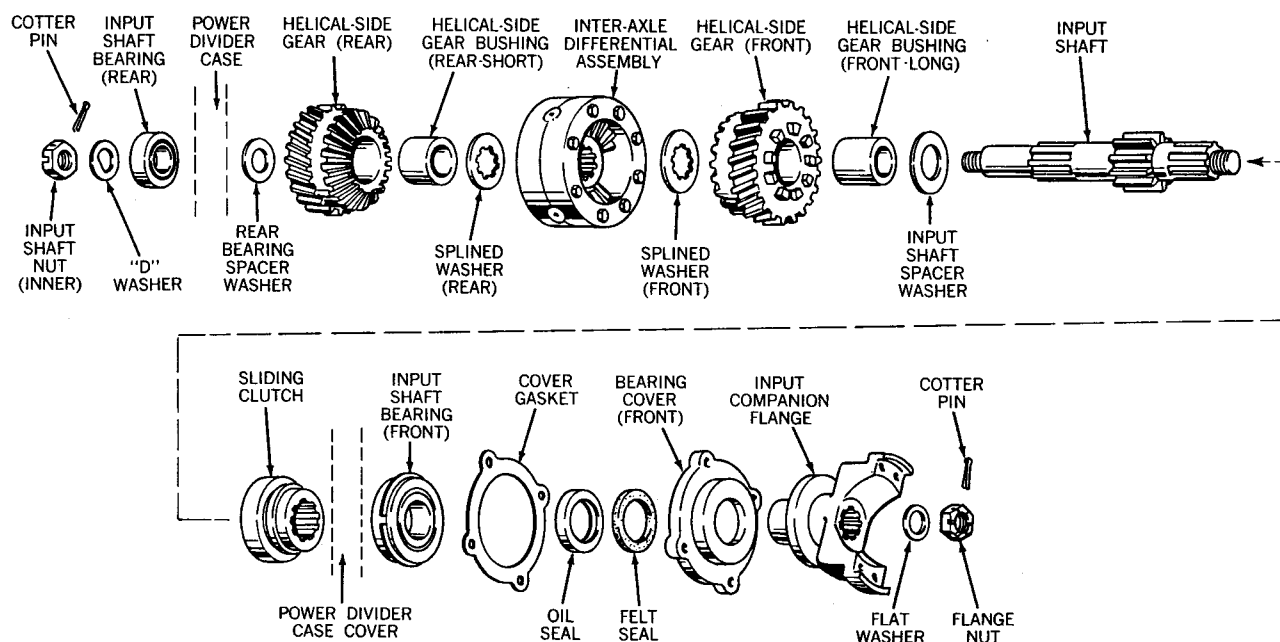


Fig. 108. Exploded View of Input Shaft

assemble input shaft

1. Temporarily install flange nut on front end of input shaft to protect threads during assembly. Place input shaft in a press, with shaft supported at nut and install parts on input shaft as follows:
2. Place input shaft spacer washer on shaft.
3. Press front helical-side gear bushing on shaft. Lubricate bushing then install front helical-side gear over bushing. *Bushing and gear must rest firmly against spacer washer.*
4. Place front spider splined washer on shaft. Place inter-axle differential assembly on shaft, *positioning bolt heads toward companion flange*. Place rear spider splined washer on shaft. *Make certain washer splines are engaged with input shaft splines.*
5. Press rear helical-side gear bushing on shaft. Lubri-

cate bushing then install rear helical-side gear over bushing. *Bushing and gear must rest firmly against splined washer.*

6. Place rear bearing spacer washer on shaft.
7. Temporarily place a "dummy sleeve" (1½ in. inside diameter x 1 in. long), "D" washer and input shaft inner nut on shaft. Tighten nut to correct torque, then rotate shaft parts by hand. Gears and inter-axle differential should rotate freely without bind. After testing input shaft reassembly, remove temporarily-installed nut, "D" washer and "dummy sleeve".

A press and dummy sleeve (1½ in. inside diameter x 3 in. long) can be used as an alternate method of checking input shaft assembly. Apply 5 to 6 tons pressure on shaft and check for free rotation of gears and inter-axle differential.

With shafts and case cover partially assembled, reassemble power divider.

install subassemblies and assemble power divider

1. Temporarily install companion flange on partially assembled input shaft. Place input shaft assembly in vise, positioning front end of shaft down and gripping flange in vise jaws.
2. Place power divider case (*front side down*) over

partially-assembled input shaft. With rear bearing spacer washer on input shaft, install rear bearing in divider case bore and on input shaft. Lubricate bearing. Install "D" washer and inner nut on shaft. Tighten nut to correct torque and install cotter pin.

Model 22M, 28M and 32M Axles

install subassemblies and assemble power divider (continued)

3. Install output shaft rear bearing in divider case. *Lubricate bearing.* With new felt seal and oil seal installed in rear bearing cover, install gasket and bearing cover assembly on divider case. Install cover cap screws and lockwashers.

4. Remove divider case and input shaft assembly from vise.

5. Position divider case with front side up. Place assembled output shaft in case, taking care not to damage rear bearing oil seal.

6. Place gasket and assembled case cover on divider case. *Make certain sliding clutch engages splines of input shaft.* Install stud nuts and lockwashers to fasten cover to case. Tighten stud nuts to correct torque.

7. Install felt seal and oil seal in input shaft front bearing cover. Place gasket and bearing cover assembly on case cover. Install cap screws and lockwashers. *Do not tighten cap screws until companion flange is installed.*

8. Install companion flange, flat washer and flange nut on input shaft. Tighten flange nut to correct torque. In-

stall cotter pin. Tighten front bearing cover cap screws to correct torque.

9. Install same quantity and size shims (*that were removed in disassembly*) on pinion bearing cage. Place shims and pinion bearing cage in divider case.

10. Insert drive pinion assembly through opposite side of divider case until inner bearing cone is seated in inner bearing cup. Then place outer bearing cone, tongued washer and pinion nut on drive pinion. Tighten nut to correct torque and install cotter pin.

11. Install new cork seal in cage groove. Install cage cover and fasten with nuts, cap screws and lockwashers. Tighten nuts and cap screws to correct torque.

12. Insert bearing sleeve in divider case and over pinion inner bearing. Align sleeve hole with hole in case then install set screw and lockwasher.

13. Loosen cap screws holding output shaft bearing cover. Install companion flange, flat washer and flange nut on output shaft. Tighten nut to correct torque then install cotter pin. Tighten bearing cover cap screws to correct torque.

► reassembly of axle differential

Model 22M and 28M Axles

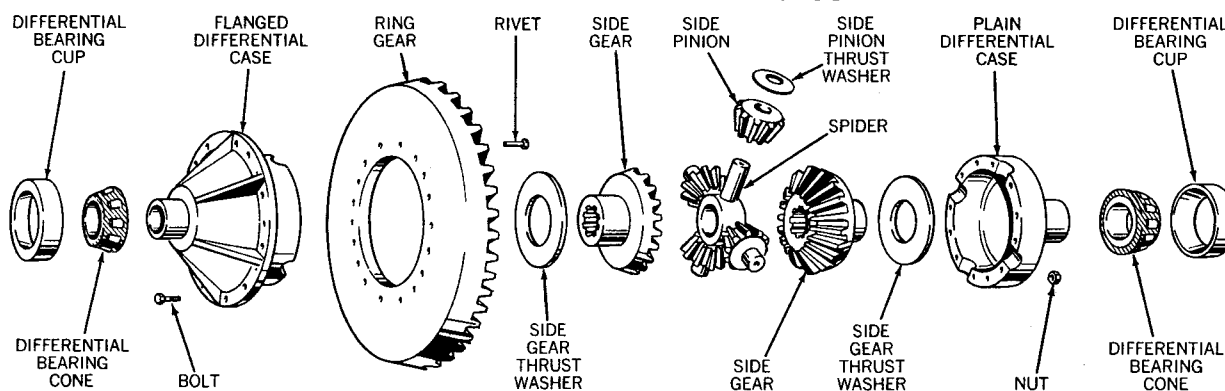


Fig. 109. Exploded View of Axle Differential (Model 22M and 28M Axles)

assemble axle differential Model 22M and 28M Axles

1. Rivet (cold) ring gear to flanged differential case using a press, placing flat side head of rivets on ring gear side. Compress rivets to pressures shown on page 122.

2. Press bearing cones on differential cases. If removed, install differential oil lubricator in flanged differential case and secure with cap screw and lockwasher.

Lubricate internal parts of differential during reassembly.

3. Place thrust washer and right-hand side gear in

flanged differential case. Assemble side pinions and thrust washers to spider, then place this assembly on flanged differential case (see fig. 97). Place left-hand side gear and thrust washer on side pinions.

4. Tap plain differential case into place, aligning punch marks (*made during disassembly*). Install four bolts and locknuts to draw case halves together. *Check assembly for free rotation.* Install remaining bolts and locknuts then tighten all nuts to correct torque.



TRUCK AXLES

"M" series tandem drive axles

Model 32M and 36M Axles

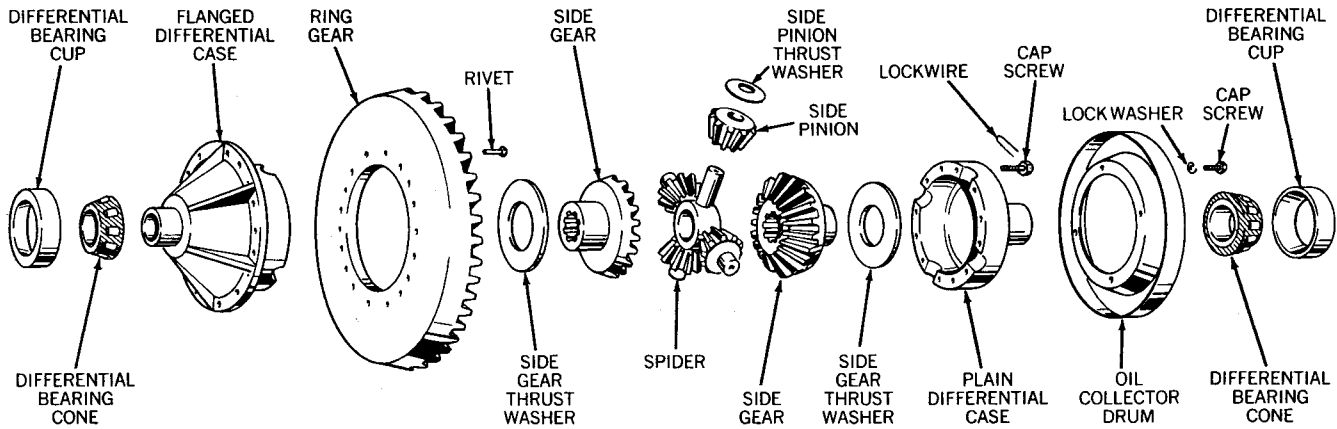


Fig. 110. Exploded View of Axle Differential (Model 32M and 36M Axles)

assemble axle differential Model 32M Axles

1. Rivet (cold) ring gear to flanged differential case using a press, placing flat head of rivets on ring gear side. Compress rivets to pressures shown on page 122.

2. Press bearing cones on differential cases.

Lubricate internal parts of differential during reassembly.

3. Place thrust washer and right-hand side gear in flanged differential case. Assemble side pinions and thrust washers to spider, then place this assembly on

flanged differential case (see fig. 100). Place left-hand side gear and thrust washer on side pinions.

4. Tap plain differential case into place, aligning punch marks (*made during disassembly*). Do not install oil collector drum at this time. Assemble drum to differential case after differential is installed in carrier. Install (*equally spaced*), the four large tapped head cap screws to draw case halves together. Check assembly for free rotation. Install eight remaining cap screws and tighten all cap screws to correct torque, then lockwire.

For Torque Requirements . . . refer to page 122.

assemble axle differential Model 36M Axles

1. Rivet (cold) ring gear to flanged differential case using a press, placing flat head of rivets on ring gear side. Compress rivets to pressures shown on page 122.

2. Press bearing cones on differential cases. If removed, install differential oil lubricator in flanged differential case and secure with cap screw and lockwasher.

Lubricate internal parts of differential during reassembly.

3. Place thrust washer and right-hand side gear in

flanged differential case. Assemble side pinions and thrust washers to spider, then place this assembly on flanged differential case (see fig. 100). Place left-hand side gear and thrust washer on side pinions.

4. Tap plain differential case into place, aligning punch marks (*made during disassembly*). Place oil collector drum on plain differential case. Install four cap screws to draw case halves together. Check assembly for free rotation. Install remaining cap screws and tighten all cap screws to correct torque.

► reassembly and installation of differential carrier and power divider

install power divider on differential carrier Model 22M, 28M, 32M and 36M Axles

1. Using a new gasket, place power divider on differential carrier. Install stud nuts and lockwashers. Tighten stud nuts to correct torque.

install differential in carrier Model 22M, 28M and 36M Axles

1. *Lubricate differential bearings.* Place differential assembly in carrier and install differential bearing cups, adjusters and caps (*align punch marks on caps*). Install and tighten (*finger-tight*) differential bearing cap screws. Tighten bearing adjusters to correctly seat differential bearings. Adjust ring gear and drive pinion. (Refer to "Adjustment" Section of this manual.)
2. With ring gear and drive pinion correctly adjusted, tighten differential bearing cap screws to correct torque. Install cotter pins to secure adjuster locks and lockwire cap screws.

install differential in carrier Model 32M Axles

1. *Lubricate differential bearings.* Place oil collector drum on left-hand side of differential, but do not install cap screws. Place differential assembly and drum in carrier and install differential bearing cups, adjusters and caps. Install and tighten (*finger-tight*) differential bearing cap screws.
2. Install four cap screws and lockwashers to secure oil collector drum to plain differential case.
3. Tighten bearing adjusters to seat differential bearings. Adjust ring gear and drive pinion. (Refer to "Adjustment" Section of this manual.)
4. With ring gear and drive pinion correctly adjusted, tighten differential bearing cap screws to correct torque. Install cotter pins to secure adjuster locks and lockwire cap screws.
5. Adjust thrust block clearance as follows: Tighten adjusting screw (see fig. 80) to position thrust block against ring gear. Loosen adjusting screw (approximately $\frac{1}{8}$ to $\frac{1}{4}$ turn) to obtain approximately 0.010 to 0.015 in. clearance between thrust block and ring gear. Place strip sealer between carrier and lock. Tighten nut then bend ear of lock against nut to secure adjustment.

install differential carrier and power divider assembly in axle housing

Model 22M, 28M, 32M and 36M Axles

1. Using a new gasket, install differential and power divider assembly in axle housing. Install carrier to axle housing cap screws or stud nuts and lockwashers. Tighten cap screws or stud nuts to correct torque.
2. Connect lockout shift lever connections.
3. Install axle shafts and connect propeller shafts. Fill axle with correct lubricant. (Refer to "Lubrication" Section of this manual.)-



TRUCK AXLES

"M" series tandem drive axles

NOTE: Model 42M tandem axle was modified and the designation was changed to Model 50M. The following modifications were made: Differential carrier mounting cap screws were changed to studs. Helical gears are reverse cut. Carrier face wall thickness was increased to $\frac{7}{8}$ inch.

► REAR REAR AXLE OVERHAUL (Model 50M Axles)

Instructions for the rear rear axle are essentially the same as Model 50M forward rear axle, except for removal of power divider and drive pinion:

1. The rear rear axle is not equipped with a power divider. The drive pinion for the rear rear axle is mounted in a bearing cage at the front side of the dif-

ferential carrier. The drive pinion can be removed and installed as a complete assembly, consisting of pinion, bearings, cage and companion flange.

2. Disassembly and reassembly of differential assembly and countershaft are the same as instructions for the forward rear axle.

► FORWARD REAR AXLE OVERHAUL (Model 50M Axles)

► removal and disassembly of differential carrier and power divider

remove differential carrier and power divider assembly from axle housing

1. Drain lubricant. Disconnect propeller shafts and remove axle shafts.
2. Disconnect lockout shift lever connections.
3. Remove differential carrier to axle housing stud nuts and lockwashers. Lift differential carrier and power divider assembly from axle housing. Discard carrier gasket.

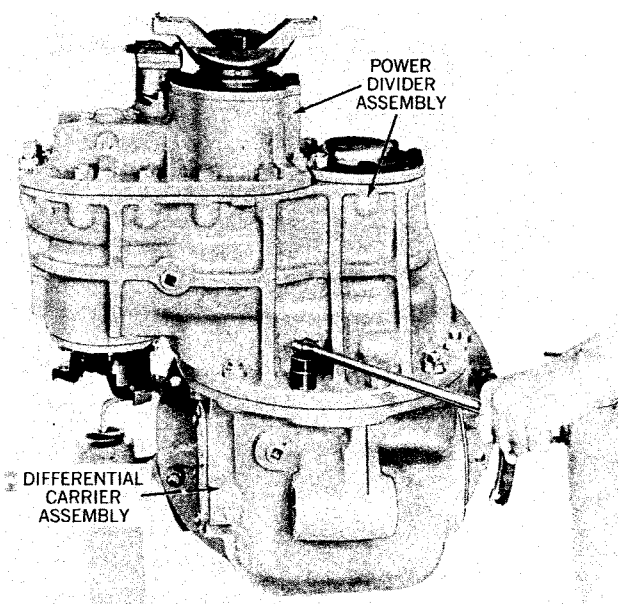


Fig. 111.

loosen drive pinion, input flange and output flange nuts

1. Place differential carrier and power divider assembly in repair stand.

If preliminary inspection reveals that ring gear and drive pinion are satisfactory, check backlash with dial indicator and take a tooth contact pattern for reference and easier adjustment during reassembly.

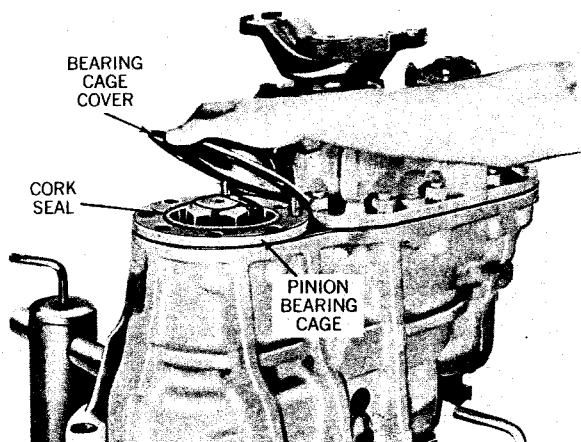


Fig. 112.

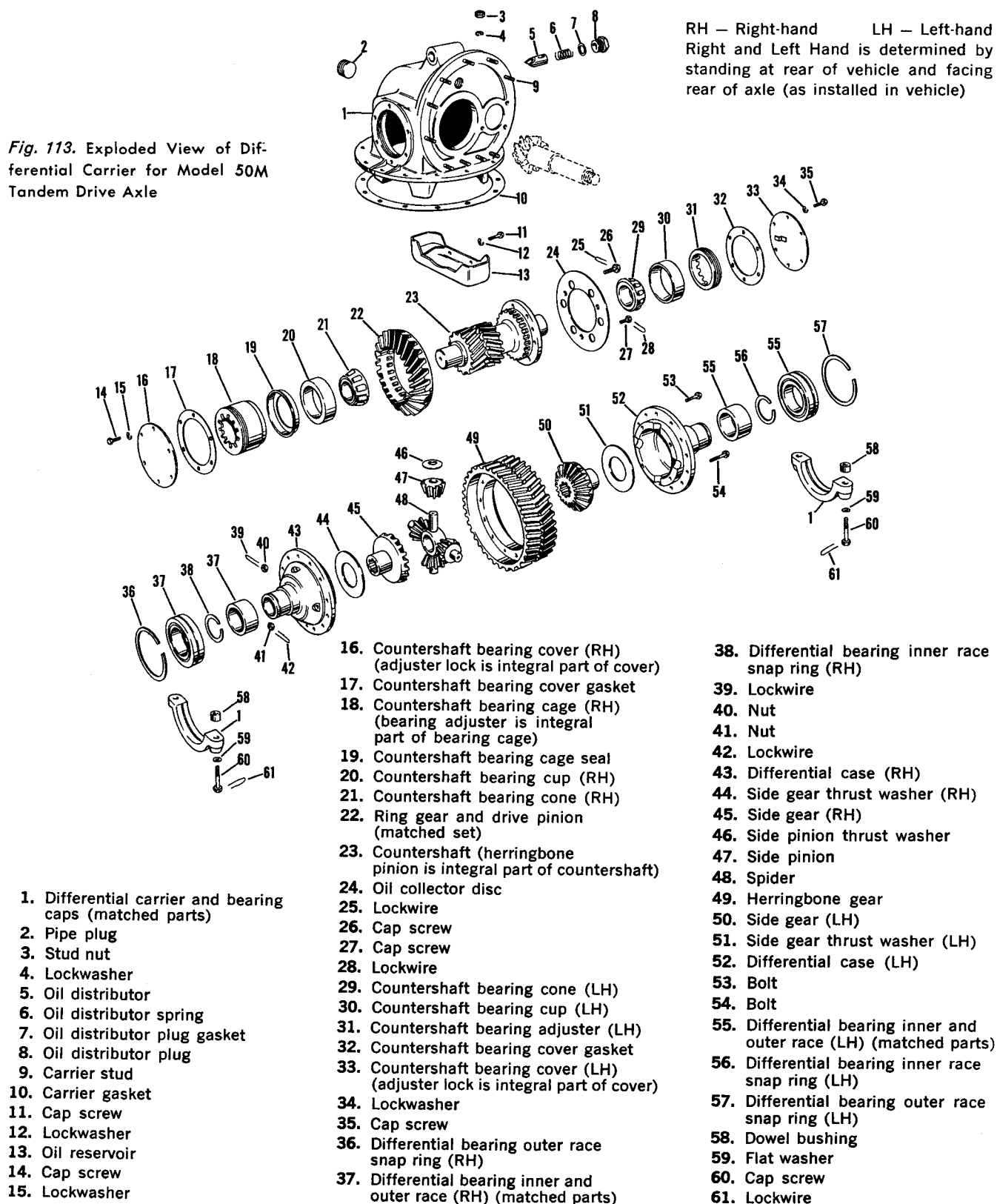
2. Remove pinion bearing cage cover nuts, cap screws and lockwashers, then lift off cage cover. Remove and discard cork seal. Remove cotter pin from drive pinion nut. Hold input and output companion flanges and loosen pinion nut. *Do not remove pinion nut at this time.*
3. Remove cotter pin from input flange nut. Hold input flange and loosen nut. *Do not remove flange nut at this time.*
4. Remove cotter pin from output flange nut. Hold output flange and loosen nut. *Do not remove flange nut at this time.*

► remove power divider from differential carrier

1. Remove power divider case to differential carrier stud nuts and lockwashers. Lift power divider assembly from differential carrier. Discard divider case gasket.

Model 50M Axles

Fig. 113. Exploded View of Differential Carrier for Model 50M Tandem Drive Axle





TRUCK AXLES

"M" series tandem drive axles

Model 36M and 50M Axles

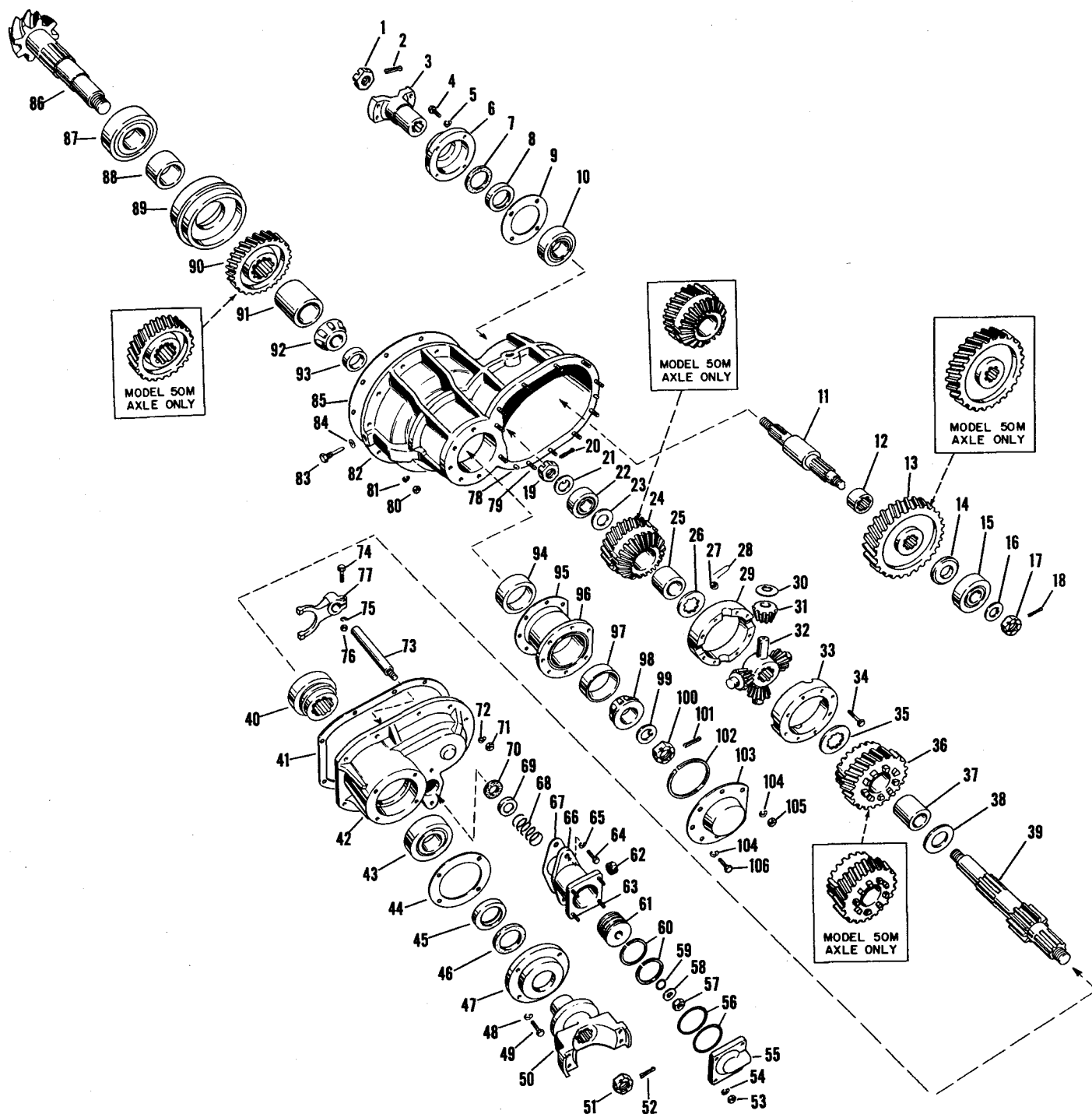


Fig. 114. Exploded View of Power Divider for Model 36M and 50M Tandem Drive Axles

Model 36M and 50M axles

LEGEND FOR FIGURE 114

Power Divider for Model 36M and 50M Tandem Drive Axles

Reference to "FRONT" indicates the input companion flange side of power divider. "REAR" indicates the differential carrier side.

- | | | |
|--|--|--|
| 1. Flange nut | 34. Bolt | 69. Seal retainer |
| 2. Cotter pin | 35. Differential spider splined washer (front) | 70. Felt seal |
| 3. Output companion flange | 36. Helical and differential side gear (front) | 71. Stud nut |
| 4. Cap screw | 37. Helical and differential side gear bushing (front, long) | 72. Lockwasher |
| 5. Lockwasher | 38. Input shaft spacer washer | 73. Push rod |
| 6. Output shaft bearing cover (rear) | 39. Input shaft | 74. Bolt |
| 7. Felt seal | 40. Sliding clutch | 75. Lockwasher |
| 8. Oil seal | 41. Power divider case cover gasket | 76. Nut |
| 9. Bearing cover shim | 42. Power divider case cover | 77. Shift fork |
| 10. Output shaft bearing (rear) | 43. Input shaft bearing (front) | 78. Dowel |
| 11. Output shaft | 44. Bearing cover shim | 79. Stud |
| 12. Helical gear spacer | 45. Oil seal | 80. Stud nut |
| 13. Output shaft helical gear | 46. Felt seal | 81. Lockwasher |
| 14. Front bearing spacer washer | 47. Input shaft bearing cover (front) | 82. Power divider case |
| 15. Output shaft bearing (front) | 48. Lockwasher | 83. Bearing sleeve set screw |
| 16. Tongued washer | 49. Cap screw | 84. Lockwasher |
| 17. Output shaft nut (front) | 50. Input companion flange | 85. Power divider case gasket |
| 18. Cotter pin | 51. Flange nut | 86. Drive pinion and ring gear (matched set) |
| 19. Input shaft nut (inner) | 52. Cotter pin | 87. Pinion bearing (inner) |
| 20. Cotter pin | 53. Stud nut | 88. Pinion inner bearing spacer (50M only) |
| 21. Tongued washer | 54. Lockwasher | 89. Inner bearing sleeve |
| 22. Input shaft bearing (rear) | 55. Shift cylinder cover | 90. Helical gear |
| 23. Rear bearing spacer washer | 56. Shift cylinder cover grommets | 91. Pinion spacer (long) |
| 24. Helical and differential side gear (rear) | 57. Push rod nut | 92. Pinion bearing cone (inner) |
| 25. Helical and differential side gear bushing (rear, short) | 58. Flat washer | 93. Pinion bearing spacer |
| 26. Differential spider splined washer (rear) | 59. Push rod grommet | 94. Pinion bearing cup (inner) |
| 27. Nut | 60. Piston felt oilers | 95. Shims |
| 28. Lockwire | 61. Shift cylinder piston | 96. Pinion bearing cage |
| 29. Inter-axle differential case (male half, rear) | 62. Shift cylinder body filter | 97. Pinion bearing cup (outer) |
| 30. Side pinion thrust washer | 63. Cover stud | 98. Pinion bearing cone (outer) |
| 31. Side pinion | 64. Cap screw | 99. Tongued washer |
| 32. Spider | 65. Lockwasher | 100. Pinion nut |
| 33. Inter-axle differential case (female half, front) | 66. Shift cylinder body | 101. Cotter pin |
| | 67. Shift cylinder body gasket | 102. Cork seal |
| | 68. Compression spring | 103. Pinion bearing cage cover |
| | | 104. Lockwasher |
| | | 105. Stud nut |
| | | 106. Cap screw |



TRUCK AXLES

"M" series tandem drive axles

Model 50M Axles

► disassembly of differential carrier

disassemble differential carrier

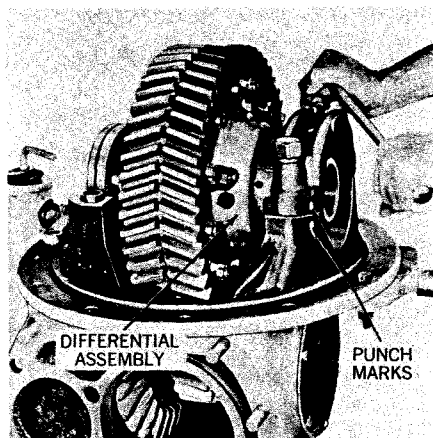


Fig. 115.

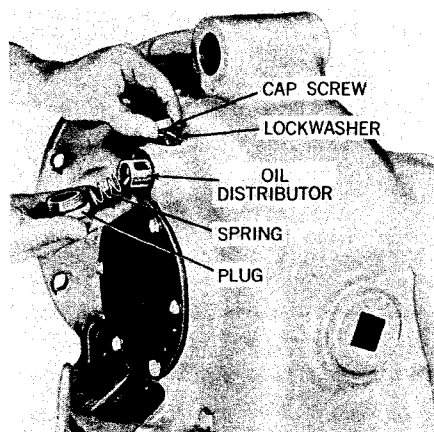


Fig. 117.

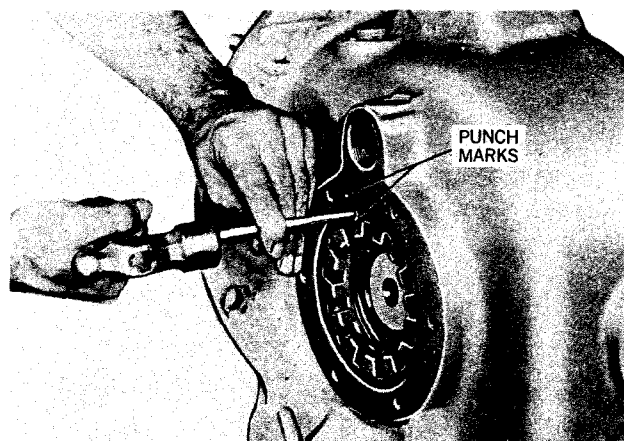


Fig. 119.

1. Punch mark differential bearing caps and carrier for correct location during reassembly.

2. Cut lockwire, then remove cap screws, flat washers and bearing caps. Lift differential assembly out of carrier. Remove outer bearing races from differential cases.

3. Unscrew oil distributor plug and remove gasket. Remove cap screw and lockwasher from differential carrier, then remove oil distributor spring and oil distributor.

4. Punch mark countershaft bearing covers and carrier for correct location in reassembly. Remove cap screws, lockwashers and covers from both sides. Discard gaskets.

5. Punch mark countershaft bearing cage (right-hand), bearing adjuster (left-hand) and differential carrier for correct position in reassembly. Remove bearing cage and adjuster from carrier. Remove bearing cage seal.

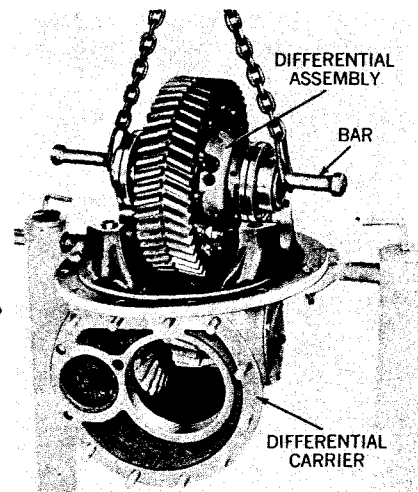


Fig. 116.

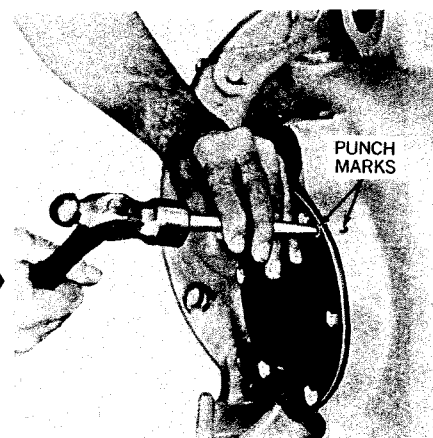


Fig. 118.

Model 50M Axles

disassemble differential carrier (continued)

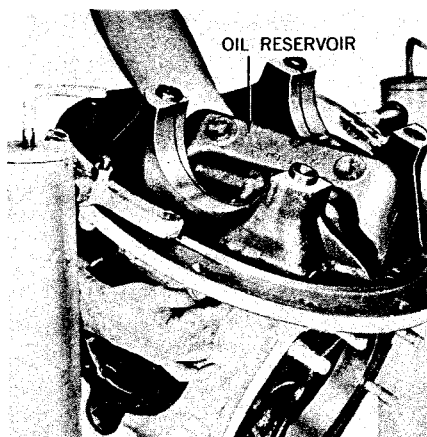


Fig. 120.

6. Remove oil reservoir cap screws and lockwashers, then remove oil reservoir from differential carrier.

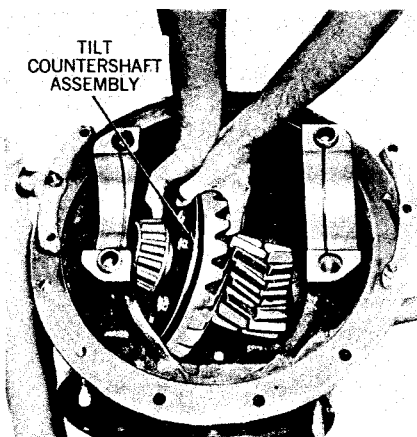


Fig. 121.

7. Remove countershaft assembly as follows: Position herringbone pinion halfway through right-hand bearing cage opening, then tilt countershaft to position ring gear at top and lift out countershaft assembly.

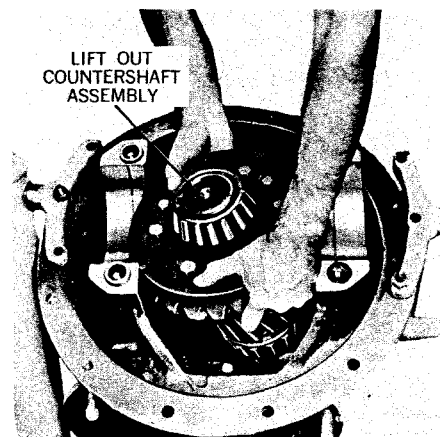


Fig. 122.

disassemble differential

1. If match marks (see figure 152) are not present, make marks to assure correct position of each case half in reassembly.

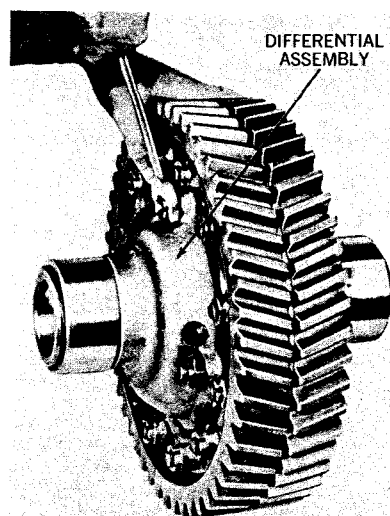


Fig. 123.

2. Cut lockwire and remove nuts and bolts holding herringbone gear and case halves together.

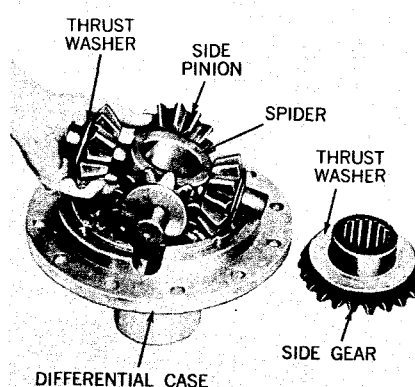


Fig. 124.

3. Lift herringbone gear and left-hand case off right-hand case. Then, remove side gears, side pinions, thrust washers and spider from right-hand differential case.

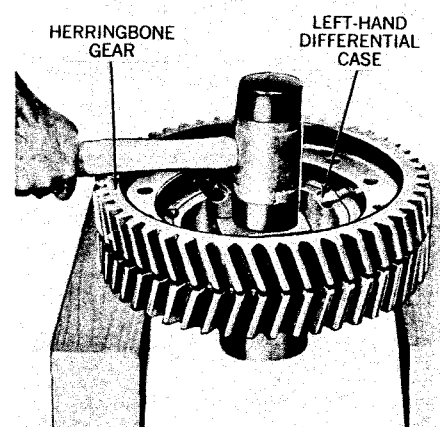


Fig. 125.

4. To separate herringbone gear and left-hand case, support gear (on bearing side of case), place side gear in case and drive off left-hand case.



TRUCK AXLES

"M" series tandem drive axles

Model 50M Axles

disassemble differential (continued)

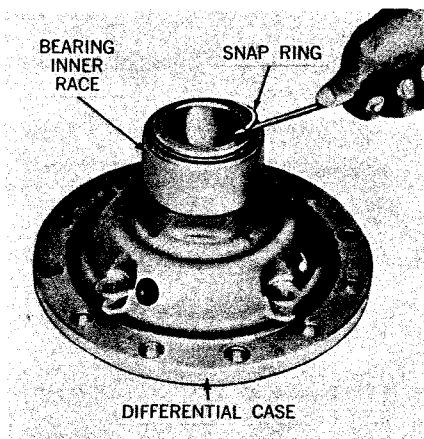


Fig. 126.

5. Remove snap rings from differential case halves.

6. Remove differential bearing inner race from case halves using split-type bearing puller.

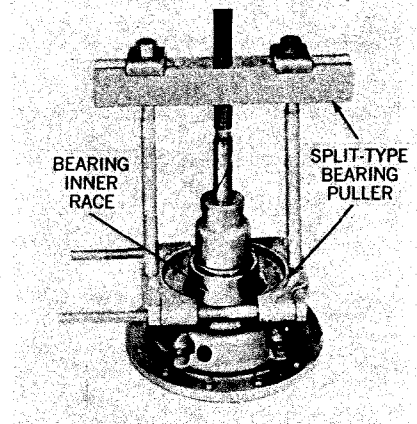


Fig. 127.

disassemble countershaft

1. Cut lockwire, then remove cap screws and oil collector disc.

2. If match marks (see figure 129) are not present, make marks to assure correct position of ring gear on countershaft flange.

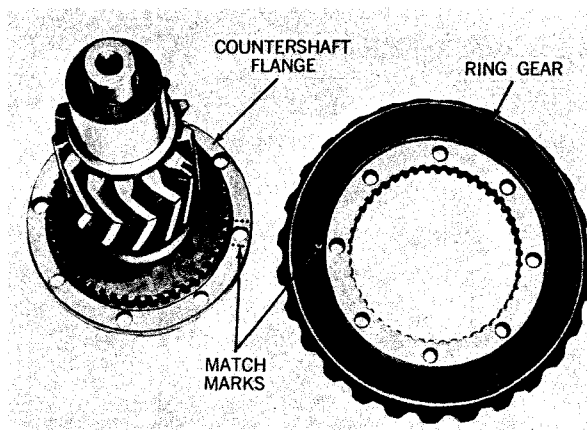


Fig. 129.

3. Remove ring gear from countershaft.

4. Remove bearing cones from countershaft using split-type bearing puller.

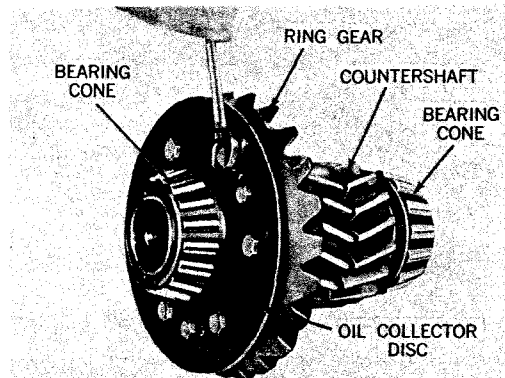


Fig. 128.

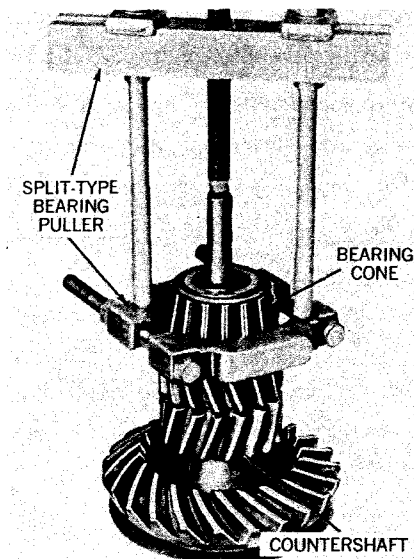


Fig. 130.

► disassembly of power divider (Model 36M and 50M Axles)

Instructions begin with disassembly of divider, followed by disassembly of subassemblies.

References to "front" indicates the input companion flange side of power divider. "Rear" indicates the differential carrier side.

disassemble power divider into subassemblies

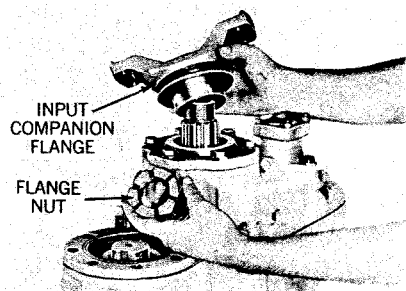


Fig. 131.

5. Remove cap screws and lockwashers from output shaft rear bearing cover. Remove cover assembly and shims from divider case. Note size and quantity of shims removed for easier adjustment during reassembly. Remove oil seal and felt seal from bearing cover.

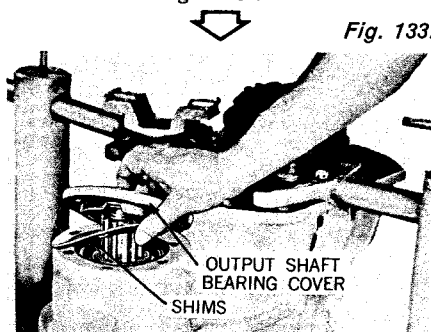


Fig. 133.

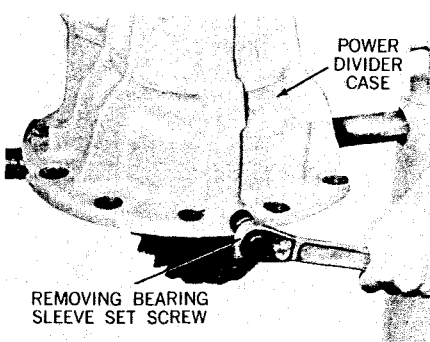


Fig. 135.

1. Mount power divider in repair stand.

2. Remove loosened input flange nut. Remove flange.

3. Loosen cap screws on input shaft front bearing cover. Do not remove cap screws or cover at this time. Remove power divider case cover to case stud nuts. Using suitable bearing puller, grip front bearing cover with puller legs and position puller screw against input shaft. Pull bearing cover and case cover assembly from case. Discard case cover gasket.

4. Remove loosened output flange nut. Remove flange.

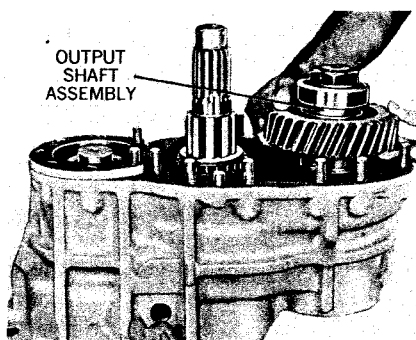


Fig. 134.

6. Working at rear end of output shaft, drive shaft end out of rear bearing. Lift output shaft assembly from divider case, then remove bearing from case.

7. Remove inner bearing sleeve set screw and lockwasher from divider case. This set screw holds drive pinion inner bearing sleeve in place.

8. Remove loosened pinion nut and tongued washer. Drive pinion assembly out rear of divider case. Remove outer bearing cone from bearing cage.

Fig. 132.

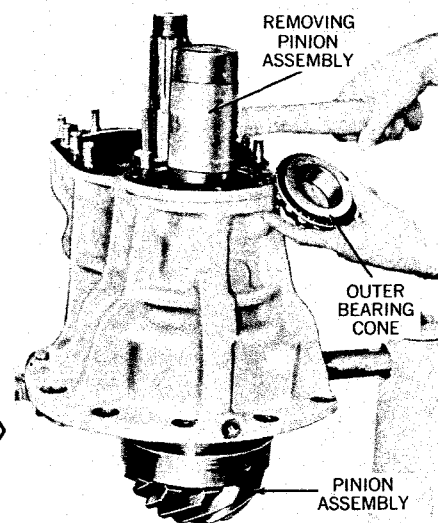
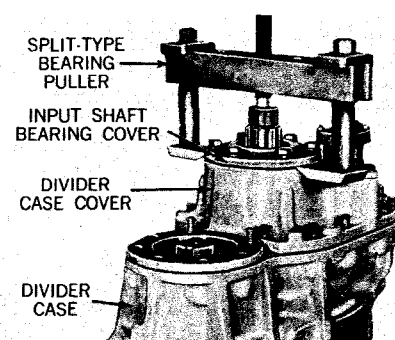


Fig. 136.



TRUCK AXLES

"M" series tandem drive axles

Model 36M and 50M Axles

disassemble power divider into subassemblies (continued)

9. Remove pinion bearing cage and shims from front side of divider case. Note size and quantity of shims removed for easier adjustment in reassembly. If replacement is necessary, remove bearing cups from bearing cage.

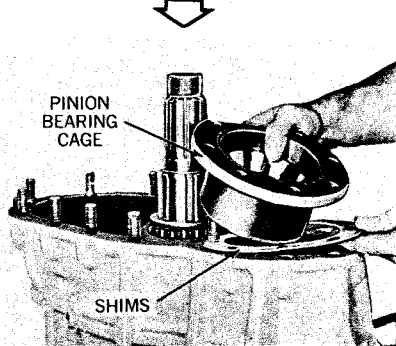


Fig. 137.

10. Remove input shaft assembly from case. This procedure can be easily accomplished by temporarily installing companion flange and nut on end of shaft. Use flange to lift assembly from case.

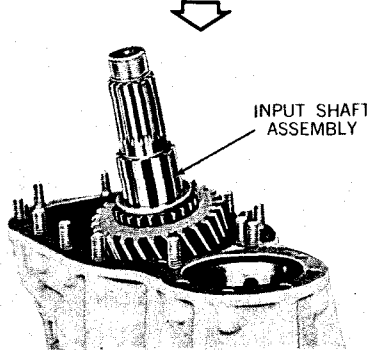


Fig. 138.

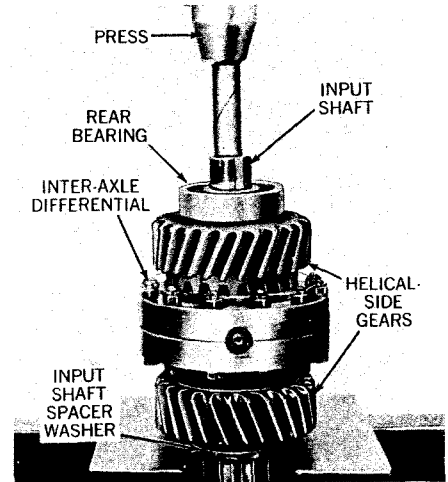


Fig. 139.

disassemble input shaft and inter-axle differential

1. Place input shaft assembly in vise, gripping companion flange. Remove cotter pin. Loosen and remove inner nut and tongued washer.

2. Place input shaft assembly in arbor press, with front helical-side gear down and input shaft front spacer washer resting on press plates (see fig. 139). Press shaft out of component parts.

3. Punch mark differential cases for correct location in re-assembly. Cut lockwire and remove nuts and bolts holding cases together. Separate case halves and remove spider, side pinions, and thrust washers.

disassemble drive pinion

1. On Model 36M Axles, remove sleeve from inner bearing. Place pinion assembly in arbor press, with pinion teeth down, and disassemble in two steps. Place

split-type bearing puller plates under helical gear then press pinion out of pinion bearing spacer, inner bearing cone, long pinion spacer and helical gear. Reposition puller plates between pinion teeth and inner race of inner bearing then press pinion out of inner bearing.

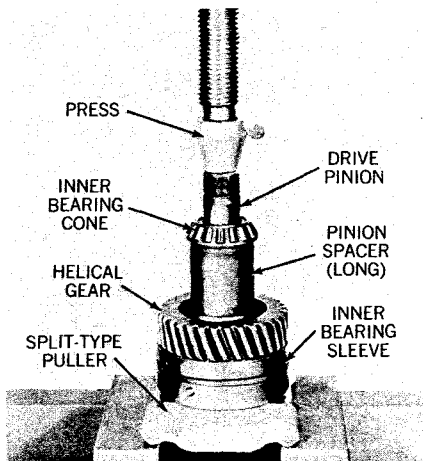


Fig. 140.

2. On Model 50M Axles, remove pinion bearing spacer. Place pinion assembly in an arbor press with pinion teeth down and split-type bearing puller plates under inner bearing sleeve. Press pinion out of inner bearing cone, long pinion spacer, helical gear and inner bearing sleeve.

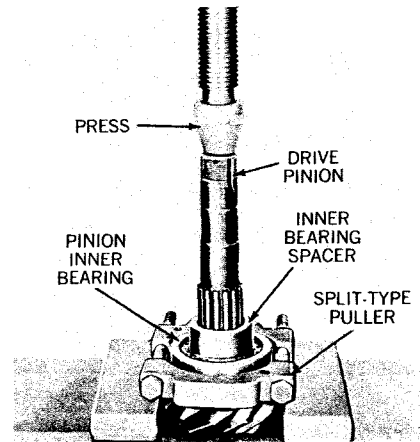


Fig. 141.

3. On Model 50M Axles, reposition puller plates under pinion inner bearing. Press pinion out of inner bearing spacer and inner bearing.

Model 36M and 50M Axles

disassemble output shaft

1. Remove cotter pin from output shaft front nut. Temporarily place companion flange on output shaft, hold flange in vise and loosen output shaft front nut. Remove front nut and tongued washer. Remove flange.
2. Place output shaft assembly in arbor press with rear end of shaft down and helical gear resting on press plates. Press shaft out of front bearing, bearing spacer washer and helical gear. Remove helical gear spacer.

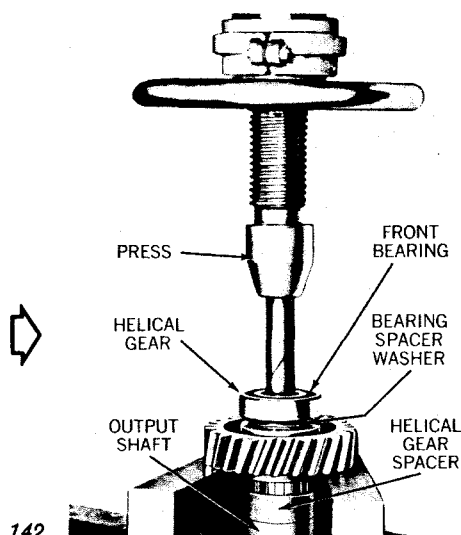


Fig. 142.

disassemble power divider case cover (with air-operated lockout)

Either mechanically-operated or air-operated lock-out may be used on Model 36M and 50M Axles. Refer to insert in figure 75 for components of mechanically-operated lockout. The following instructions are for air-operated lockout.

1. Remove nuts, lockwashers and cover from shift cylinder body. Discard cover grommets. Remove nut, flat washer and grommet from push rod.
2. Remove cap screws, lockwashers, shift cylinder body assembly and gasket from case cover. Shift cylinder body assembly includes a piston, two felt oilers and a filter.

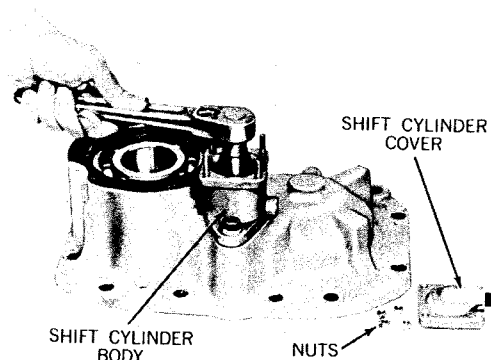


Fig. 143.

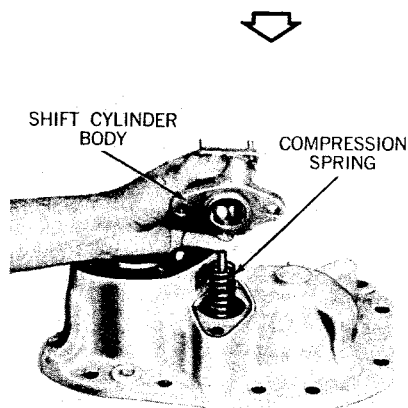


Fig. 144.

3. Remove compression spring from push rod. Remove sliding clutch and shift fork assembly from case cover. Shift fork is attached to push rod with bolt, lockwasher and nut.

4. Remove loosened cap screws, lockwashers, front bearing cover assembly and shims. Note size and quantity of shims removed for easier adjustment during re-assembly. Remove oil seal and felt seal from bearing cover. Remove input shaft bearing from case cover.

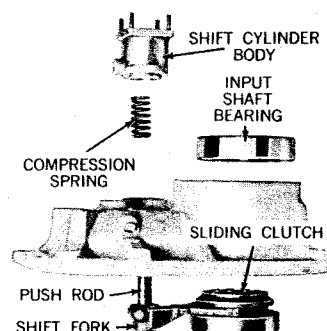


Fig. 145.

inspection and failure analysis

Refer to "Inspection and Failure Analysis" Section of this manual.



TRUCK AXLES

"M" series tandem drive axles

► reassembly of power divider

Model 36M and 50M Axles

For Torque Requirements . . . refer to page 122.

Partially assemble shafts and case cover before reassembling power divider case.

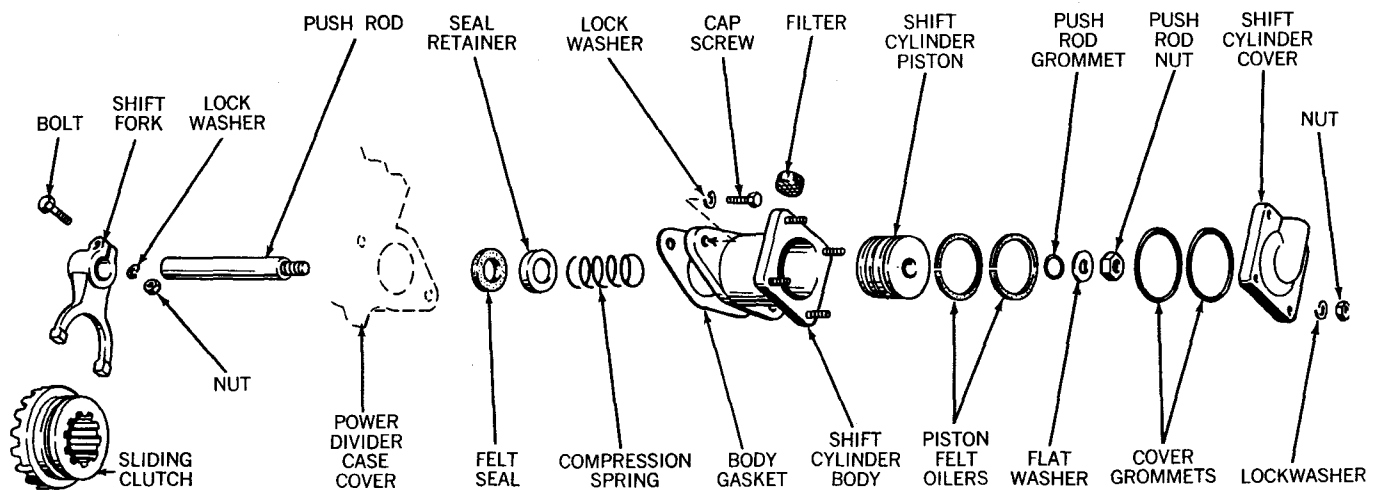


Fig.146. Exploded View of Air-Operated Lockout Mechanism

assemble divider case cover (with air-operated lockout)

Either mechanically-operated or air-operated lockout may be used on Model 36M and 50M Axles. Refer to insert in figure 75 for components of mechanically-operated lockout. The following instructions are for air-operated lockout.

1. Press front input shaft bearing in divider case cover.
2. Place felt seal and seal retainer in recess in case cover. Assemble push rod to shift fork and secure with bolt, nut and lockwasher.
3. Assemble shift fork and sliding clutch to case cover as follows: Partially insert push rod in case cover, en-

gage sliding clutch with shift fork, then push this assembly into correct mounting position in case cover.

4. Place compression spring, gasket and shift cylinder body over push rod and on case cover. Secure body with cap screws and lockwashers.

Piston felt oilers should be soaked in SAE-30 oil for one hour prior to assembly.

5. Install felt oilers on piston and insert piston assembly in body and on push rod. Place grommet on push rod, then install flat washer and nut.

6. Install grommets on cylinder cover, then install cover, nuts and lockwashers on shift cylinder body.

Model 36M and 50M Axles

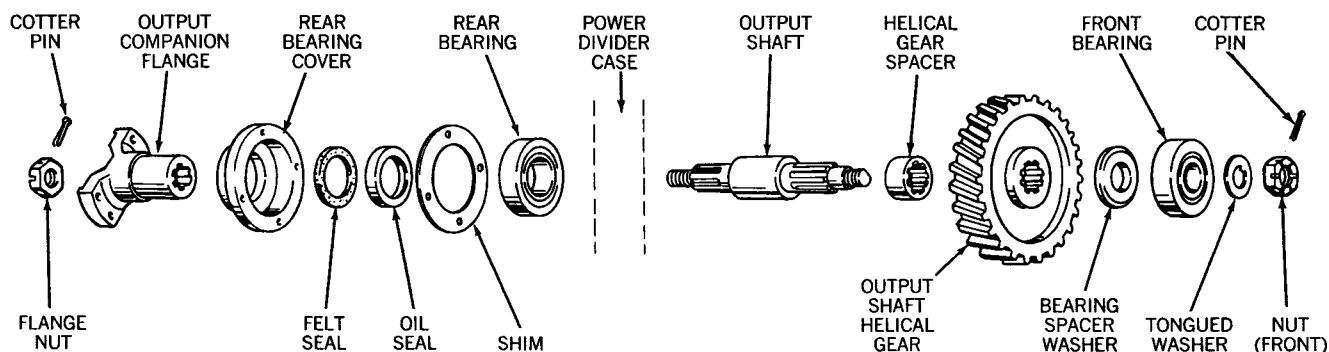


Fig. 147. Exploded View of Output Shaft

assemble output shaft

1. Press helical gear spacer on front end of output shaft. Then press helical gear, bearing spacer washer and front bearing on output shaft.
2. Temporarily place output companion flange on rear end of output shaft. Place output shaft in vise with rear

end down, gripping flange in vise jaws.

3. Install tongued washer on output shaft. Install and tighten output shaft front nut to correct torque. Install cotter pin.

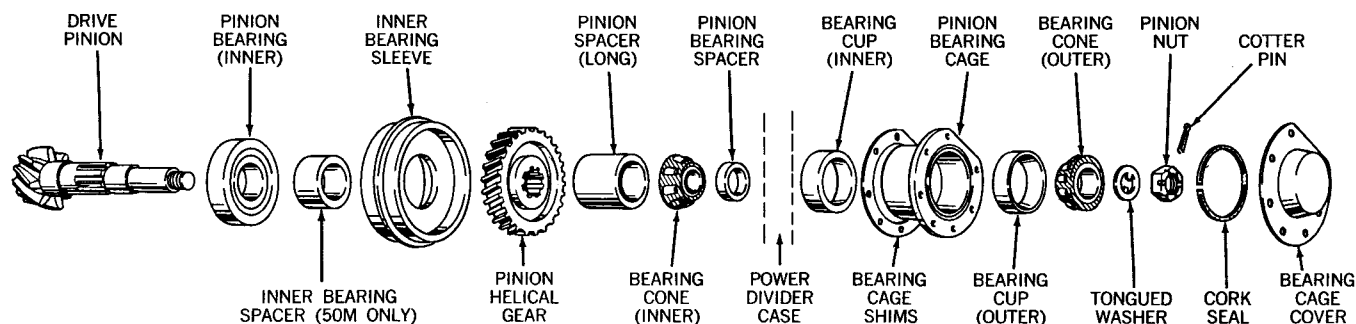


Fig. 148. Exploded View of Drive Pinion

assemble drive pinion

1. Lubricate and press pinion inner bearing on drive pinion, positioning bevel side of bearing toward pinion teeth.
2. On Model 50M Axle, press inner bearing spacer and inner bearing sleeve on drive pinion. (Inner bearing spacer is not used on Model 36M Axle. On Model 36M Axle, install inner bearing sleeve when drive pinion is assembled to power divider case.)
3. Press helical gear on pinion splines making certain long hub is against inner bearing spacer. (For Model 36M Axles, long hub is against inner bearing.)
4. Press long pinion spacer and inner bearing cone

on pinion.

5. If removed, press pinion bearing cups in bearing cage.
6. Lubricate pinion bearings. Temporarily place bearing cage, pinion bearing spacer, outer bearing cone, tongued washer and nut on drive pinion. Tighten pinion nut to correct torque. Rotate pinion bearing cage while tightening nut. Check pinion bearing preload adjustment. (Refer to "Adjustment" Section of this manual.)
7. With pinion bearings adjusted correctly, remove temporarily installed nut, tongued washer, outer bearing cone and bearing cage from pinion.



TRUCK AXLES

"M" series tandem drive axles

Model 36M and 50M Axles

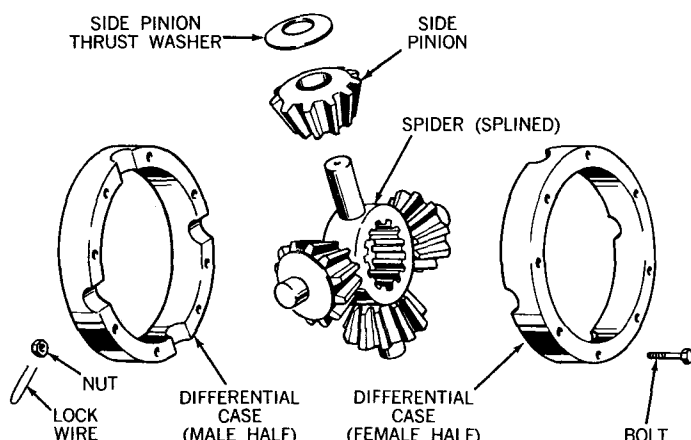


Fig. 149. Exploded View of Inter-Axle Differential

assemble inter-axle differential

Lubricate internal parts of inter-axle differential during reassembly.

1. Place side pinions and thrust washers on spider journals. Assemble spider assembly and case halves, aligning punch marks (made during disassembly). Install bolts and nuts to secure case halves. Tighten nuts to correct torque and lockwire.

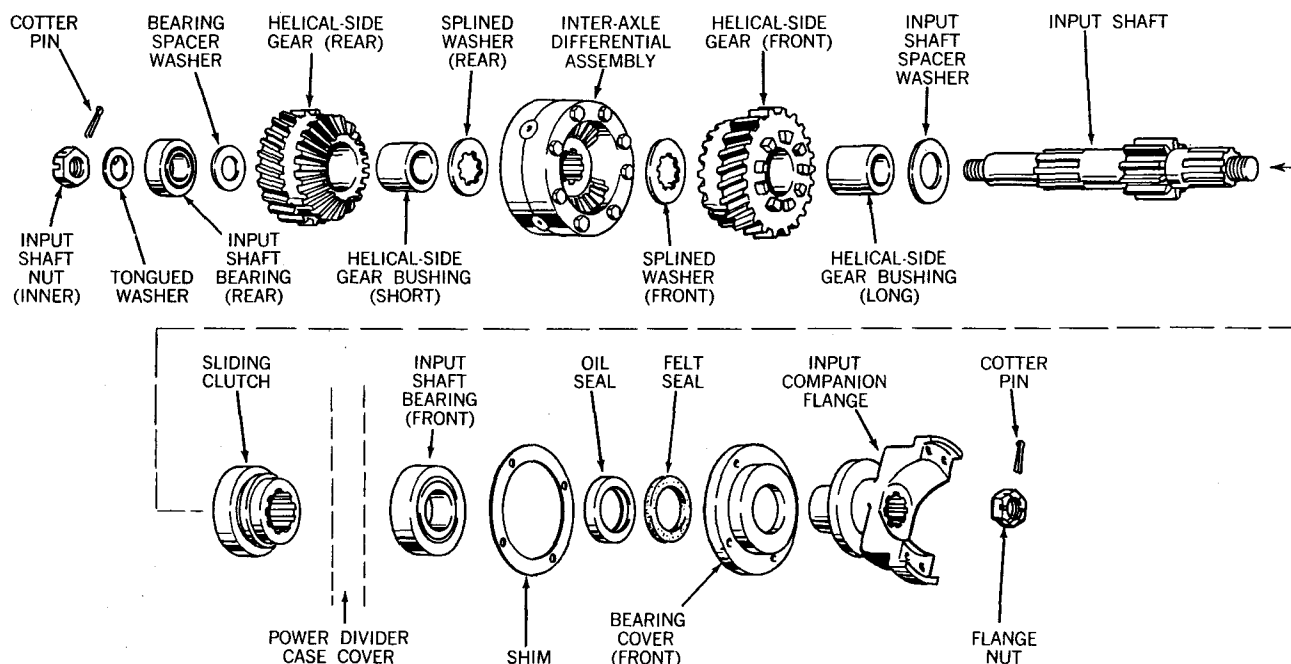


Fig. 150. Exploded View of Input Shaft

assemble input shaft

1. Temporarily install flange nut on front end of input shaft to protect threads during assembly. Place input shaft in a press, with shaft supported at nut and install parts on input shaft as follows:
2. Place input shaft spacer washer on shaft. Press long helical-side gear bushing on shaft. Lubricate bushing, then install front helical-side gear over bushing. *Bushing and gear must rest firmly against spacer washer.*
3. Place front spider splined washer on shaft. Place

inter-axle differential assembly on shaft, *positioning bolt heads toward companion flange*. Place rear spider splined washer on shaft. *Make certain washer splines are engaged with input shaft splines.*

4. Press short helical-side gear bushing on shaft. Lubricate bushing, then install rear helical-side gear over bushing. *Bushing and gear must rest firmly against splined washer.*

Model 36M and 50M Axles

assemble input shaft (continued)

5. Place rear bearing spacer washer on input shaft. Temporarily place a "dummy sleeve" (1½ inch inside diameter x 1 inch long), tongued washer and input shaft inner nut on shaft. Tighten nut to correct torque, then rotate shaft parts by hand. Gears and inter-axle differential should rotate freely without bind.

A press and "dummy sleeve" (1½ inch diameter x 3 inch long) can be used as an alternate method

With shafts and case cover partially assembled, reassemble power divider.

install subassemblies and assemble power divider

- 1.** Position power divider case with rear side up.
- 2.** Refer to figure 147 for identification of output shaft parts. Install output shaft rear bearing in divider case. Lubricate bearing.
- 3.** Install felt seal and oil seal in output shaft rear bearing cover. Using same size and quantity shims (*that were removed during disassembly*), install shims and bearing cover assembly on divider case. Install cover cap screws and lockwashers. *Do not tighten cap screws until companion flange is installed.*

BEARING CLEARANCE

To check bearing clearance or determine thickness of shims required, install bearing cover on divider case without shims. Install and tighten cap screws (finger tight). Then, using a feeler gage, measure clearance between bearing cover and divider case. This clearance measurement plus 0.003 inch would equal the thickness of shims required for correct bearing clearance.

- 4.** Rotate divider case to position front side up. Insert assembled input shaft, engaging rear bearing in bore of divider case.
- 5.** Insert assembled output shaft in divider case, inserting end of shaft through rear bearing and taking care not to damage oil seal.
- 6.** Using new case cover gasket, place divider case cover assembly on divider case, engaging sliding clutch splines with input shaft splines. Install stud nuts and lockwashers. Tighten stud nuts to correct torque.

of checking input shaft assembly. Apply 5 to 6 tons pressure on shaft and check for free rotation of gears and inter-axle differential.

6. After testing input shaft reassembly, remove temporarily installed nut, tongued washer and "dummy sleeve". Then press rear bearing on shaft and install tongued washer and inner nut. Tighten nut to correct torque and install cotter pin.

7. Install felt seal and oil seal in input shaft front bearing cover. Refer to figure 150 for identification of input shaft parts.

8. Using same size and quantity of shims (*that were removed during disassembly*), install shims and bearing cover assembly on divider case cover. Install cap screws and lockwashers. *Do not tighten cap screws until companion flange is installed.*

BEARING CLEARANCE

To check bearing clearance or determine thickness of shims required, install bearing cover on case cover without shims. Install and tighten cap screws (finger tight). Then, using a feeler gage, measure clearance between bearing cover and case cover. This clearance measurement plus 0.003 inch would equal the thickness of shims required for correct bearing clearance.

- 9.** With front bearing cover cap screws loose, install companion flange on input shaft and secure with flange nut. Tighten nut to correct torque and install cotter pin. Tighten front bearing cover cap screws to correct torque.
- 10.** Install same quantity and size shims (*that were removed in disassembly*) on pinion bearing cage, then install bearing cage assembly in divider case. Temporarily install bearing cage cap screws to retain bearing cage in divider case during pinion installation.
- 11.** Rotate divider case to position rear side up.
- 12.** With output shaft rear bearing cover cap screws loosened, install companion flange on output shaft, tak-