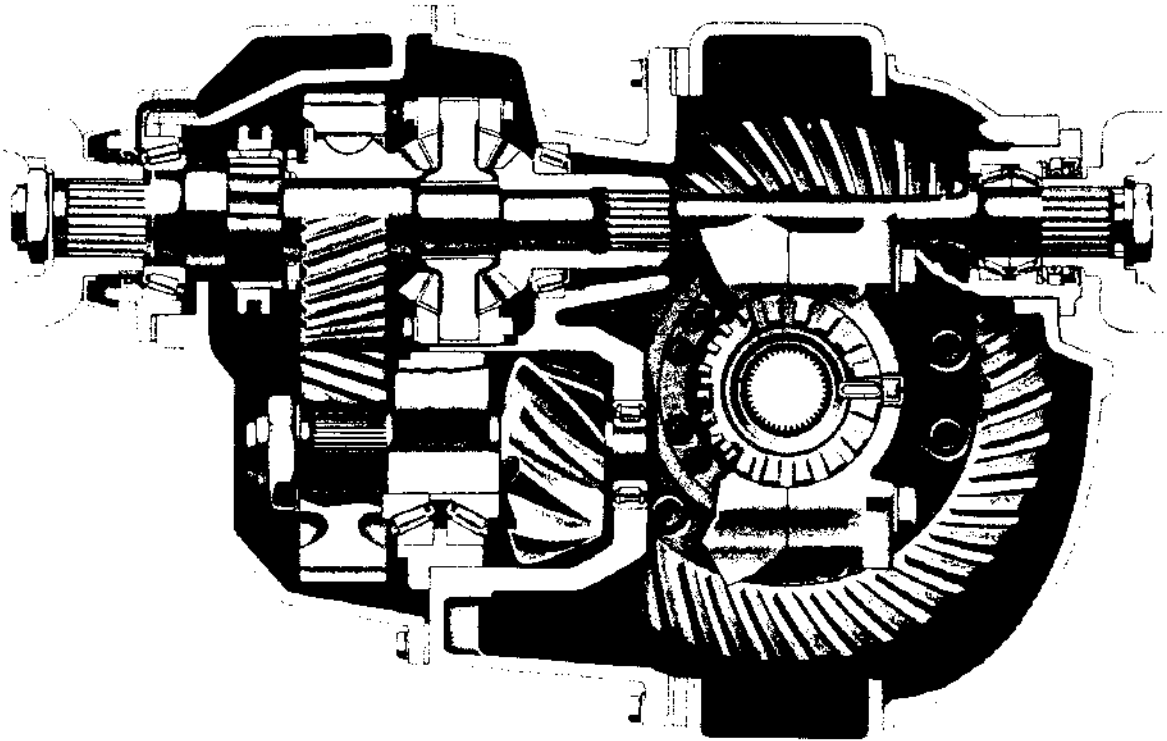
# FORWARD-REAR AXLE

Figure 1

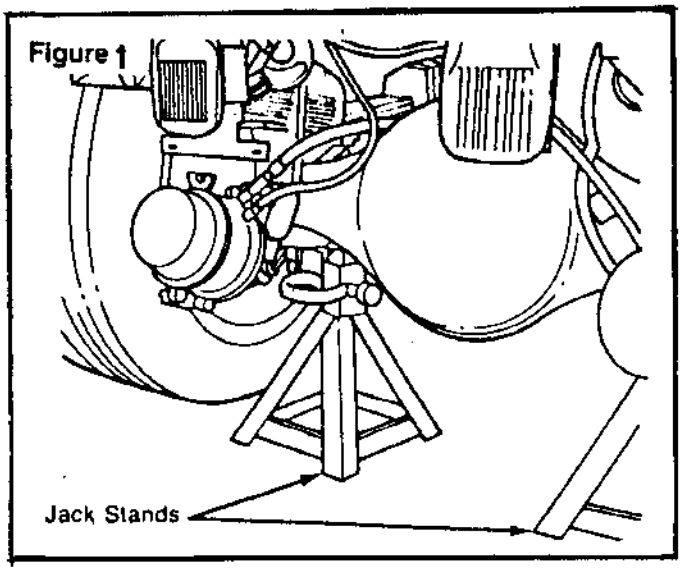
FORWARD REAR CARRIER



## I. REMOVAL OF DIFFERENTIAL CARRIER FROM AXLE HOUSING ;

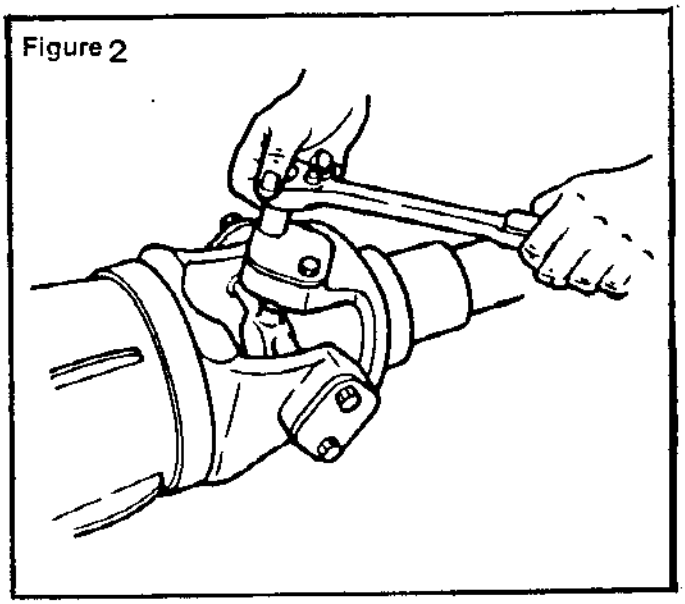
1. RAISE THE REAR END OF THE VEHICLE.

o PUT ON JACK STANDS FIG 1.




2. DISCONNECT THE PROPELLER SHAFTS FIG.2

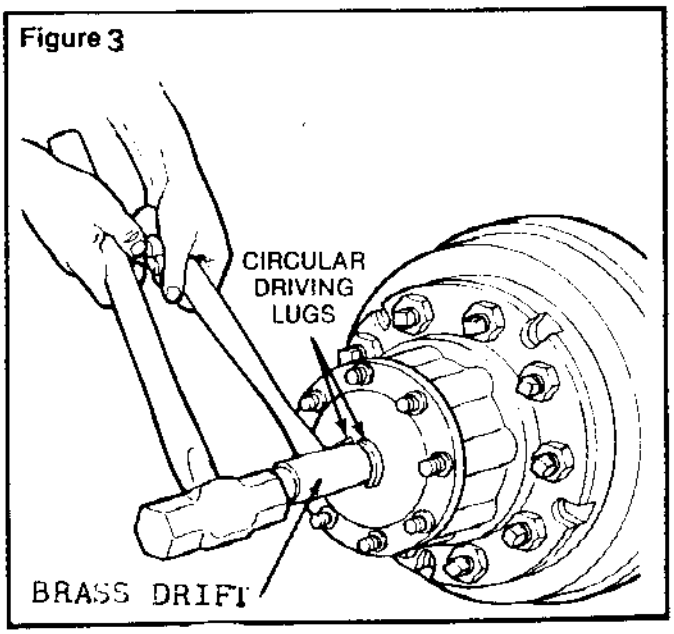
o REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL.




3. REMOVE NUTS AND WASHERS FROM THE AXLE SHAFTS

o LOOSEN THE TAPER DOWELS USING BRASS DRIFT AND HAMMER. FIG 3.

o REMOVE AXLE SHAFTS USING PULLER SCREWS



4. REMOVE OUTPUT SHAFT NUT,WASHER AND YOKE.

- REMOVE BRG.CAGE CAPSCREWS AND WASHERS. FIG.4

- PULL THE BRG.CAGE ASSY. **ALONG WITH OUTPUT SHAFT.**

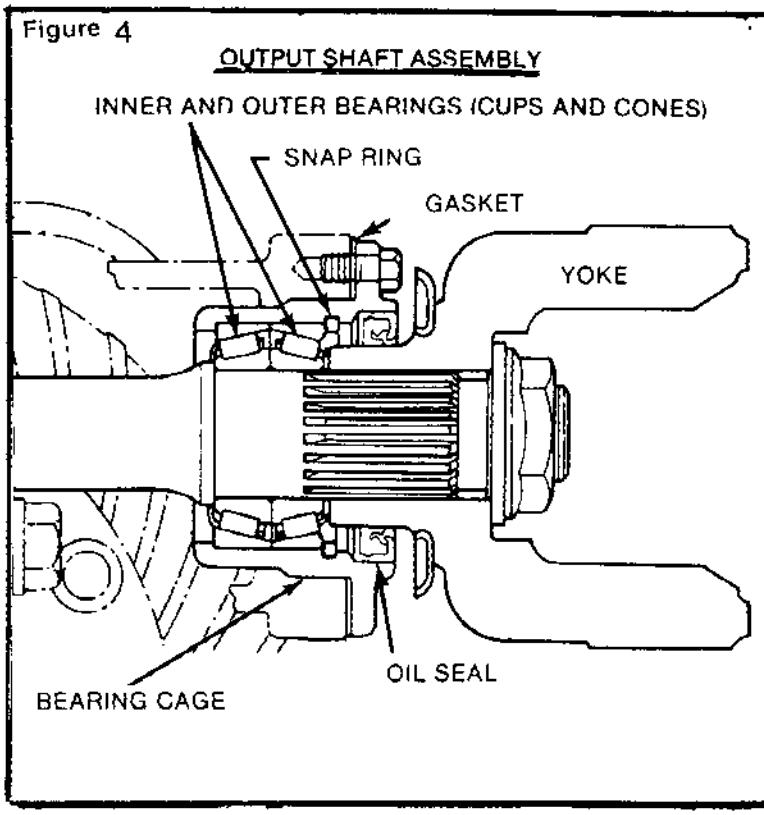
5. REMOVE ALL THE CARRIER MOUNTING FASTENERS AND WASHERS.

- PLACE A HYDRAULIC JACK UNDER THE CARRIER TO SAFELY SUPPORT THE ASSY.

- LOOSEN THE DIFF.CARRIER FROM AXLE HOUSING. USING A LEATHER MALLET HIT THE MOUNTING FLANGE AT SEVERAL POINTS.

- CAREFULLY REMOVE THE CARRIER FROM THE HOUSING.

Figure 4



## II.DISASSEMBLY

### A.OUTPUT SHAFT ASSEMBLY

1. PUT THE OUTPUT SHAFT ASSY. IN A PRESS.

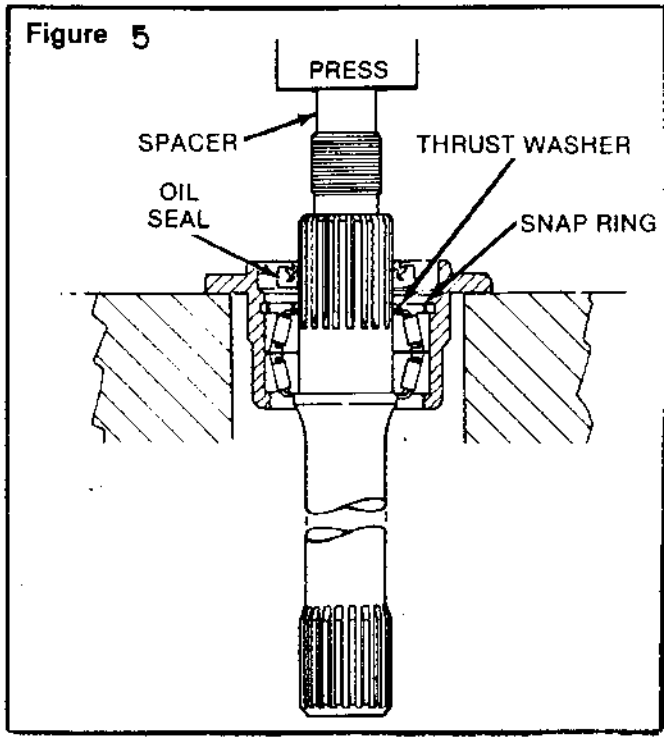
- PRESS OUT THE SHAFT THRU BRG.CAGE. FIG. 5

- OIL SEAL,SNAP RING,THRUST WASHER AND BEARINGS WILL REMAIN IN BRG.CAGE.

2. REMOVE OIL SEAL ,SNAP RING AND THRUST WASHER.

3. REMOVE CUPS AND CONES OF INNER AND OUTER BEARINGS FROM THE CAGE.

Figure 5




### B.HELICAL GEAR COVER ASSY.

4. INSTALL THE CARRIER ASSY. IN A REPAIR STAND.

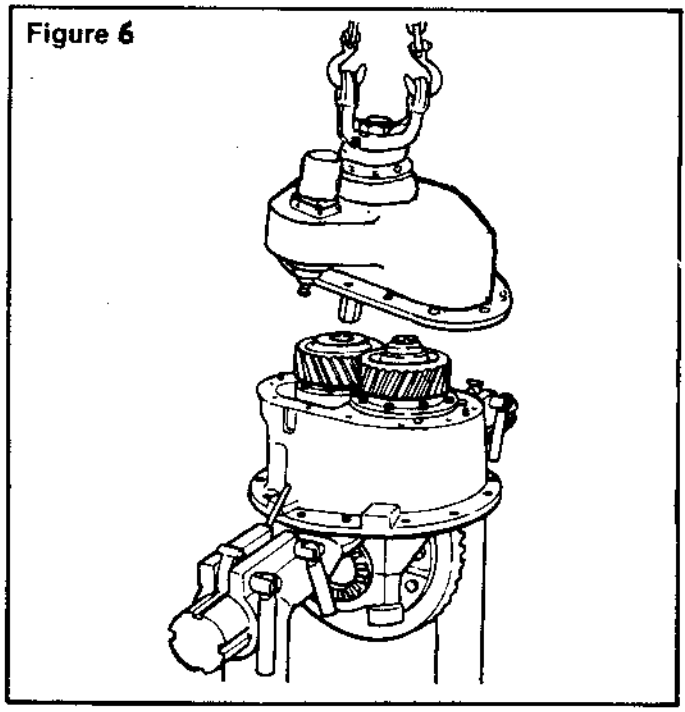
5. LOOSEN THE COMP.FLANGE NUT.

   BUT DO NOT REMOVE FROM THE INPUT SHAFT.

6. REMOVE THE GEAR COVER TO CARRIER MOUNTING FASTENERS.

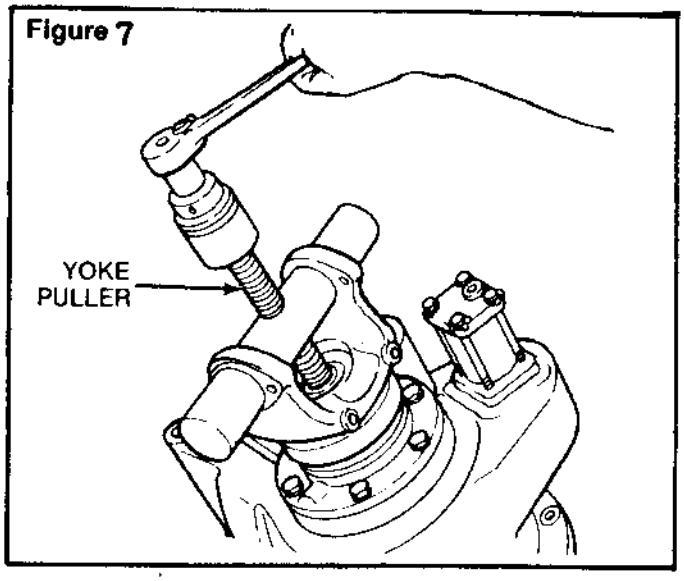
- SEPARATE THE GEAR COVER ASSY. FIG.6

Figure 6



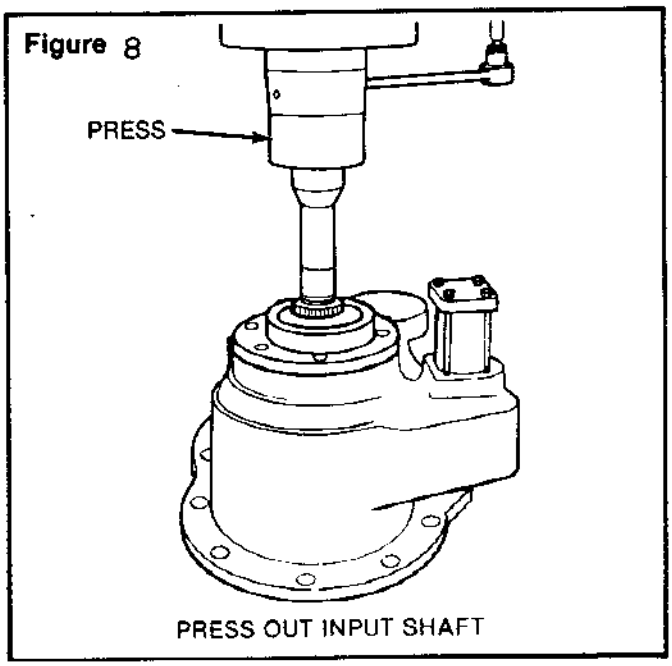
7. REMOVE COMP.FLANGE NUT AND THEN COMP.FLANGE. FIG.7

o USE A PULLER IF NECESSARY.




8. USE A PRESS AND TAKE OUT THE INPUT SHAFT.
FIG.8

o NOW, THE SHIFT COLLER WILL FALL FROM THE SHIFT FORK.




9. REMOVE BRG.CAGE CAPSCREWS AND WASHERS.

10. REMOVE BRG.CAGE ASSY.AND SHIM PACK.

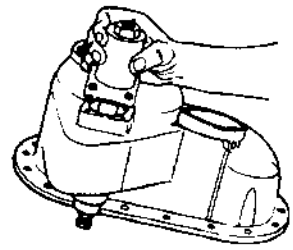
o KEEP THE SHIM PACK INTACT.

11. REMOVE OIL SEAL.

o REMOVE BEARING CUP USING A PULLER.

12. REMOVE THE SHIFT UNIT BY REMOVING FOUR CAPSCREWS.FIG.9

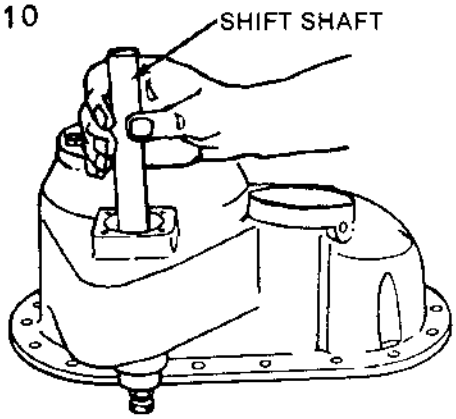
Figure 9



13. PULL SHIFT SHAFT THRU AIR CHAMBER OPENING IN COVER.

o SHIFT FORK AND SPRING WILL DROP OUT WHEN SHAFT IS REMOVED. FIG.10

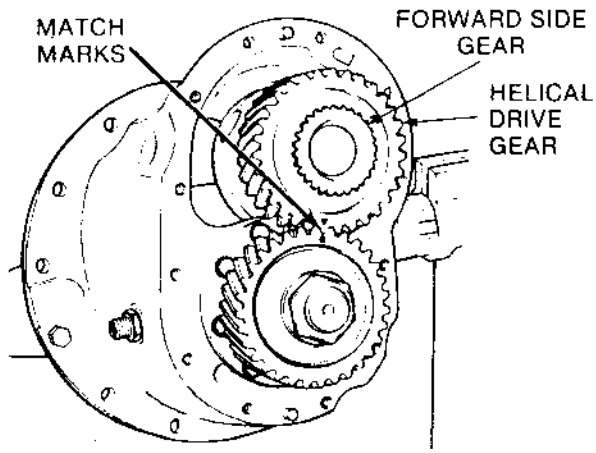
Figure 10




C.INTER-AXLE ASSEMBLY.

14. MARK MATCHING MARKS ON HELICAL GEARS BEFORE DISMANTLING.FIG.11

Figure 11




15. LIFT FORWARD SIDE GEAR AND THRUST WASHER.

16. LIFT INTER AXLE DIFF.CASE AND NEST ASSY.FIG.12

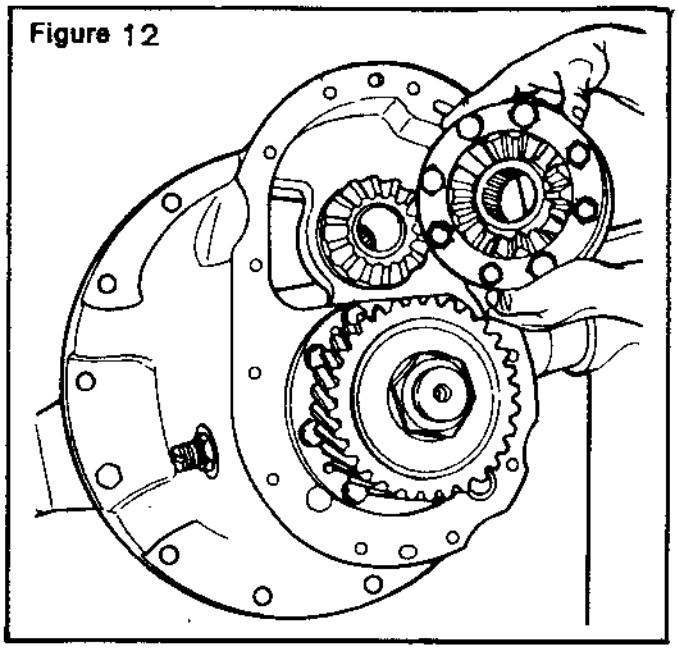


Figure 12

17. BEFORE DISMANTLING INTER AXLE DIFF.NEST ASSY MAKE MATCH MARKS. FIG.13

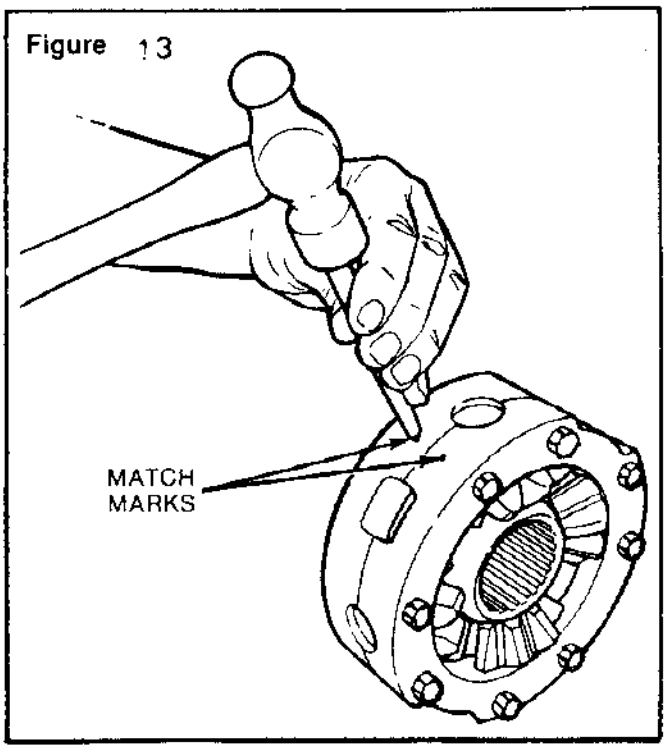


Figure 13

- REMOVE CAPSCREWS,NUTS AND WASHERS.

- DISMANTLE NEST ASSY.

18. REMOVE REAR SIDE GEAR ALONG WITH BEARING FROM CARRIER.

- REMOVE BRG.CUP FROM CARRIER USING A BEARING PULLER.

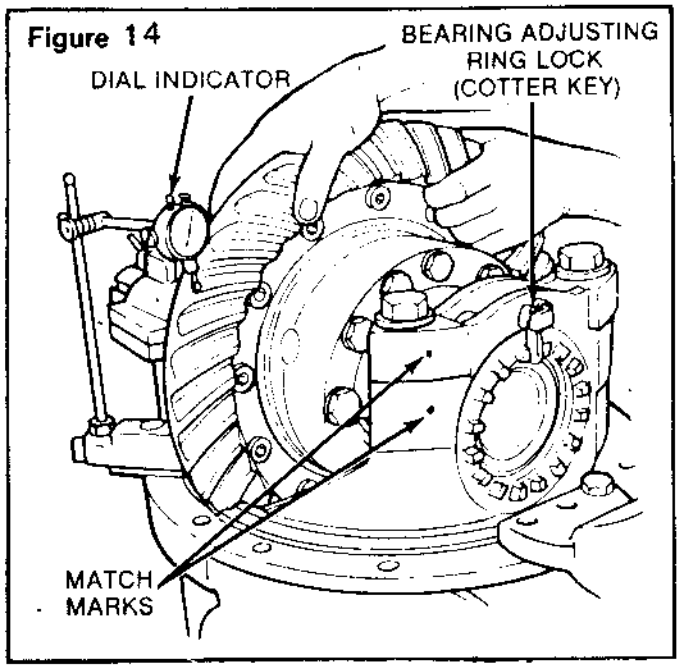
- REMOVE BRG.CONE USING A PULLER FROM SIDE GEAR.

D.MAIN DIFFERENTIAL.

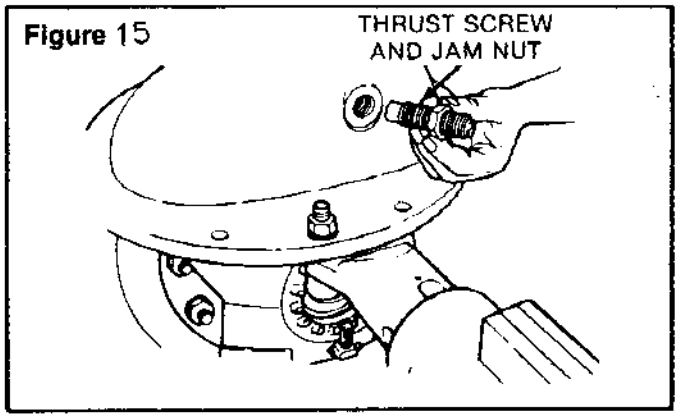
19. **MOUNT THE CARRIER IN THE REPAIR STAND SO THAT THE RING GEAR IS ON TOP**

o IF SAME GEAR SET IS TO BE REUSED RECORD THE BACKLASH BEFORE DISMANTLING.FIG.14

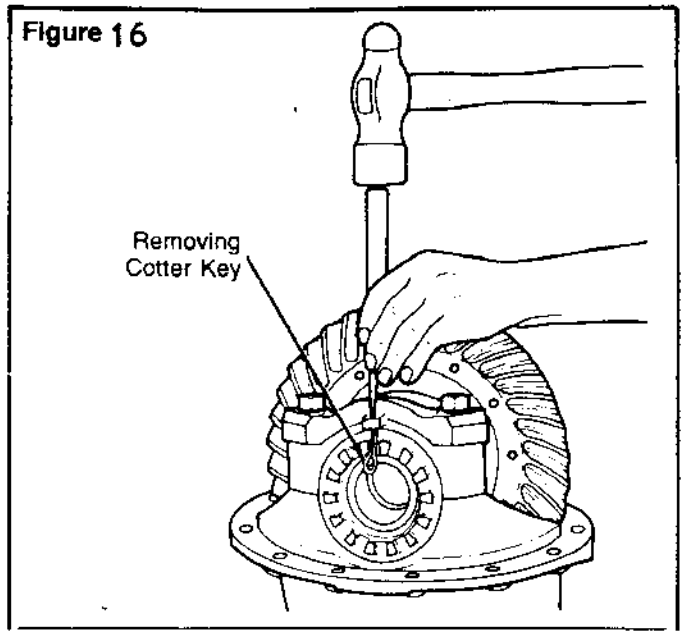
20. MAKE MATCH MARKS ON CARRIER LEG AND BEARING CAP.FIG.14




21. REMOVE THRUST SCREW AND JAM NUT FIG. 15

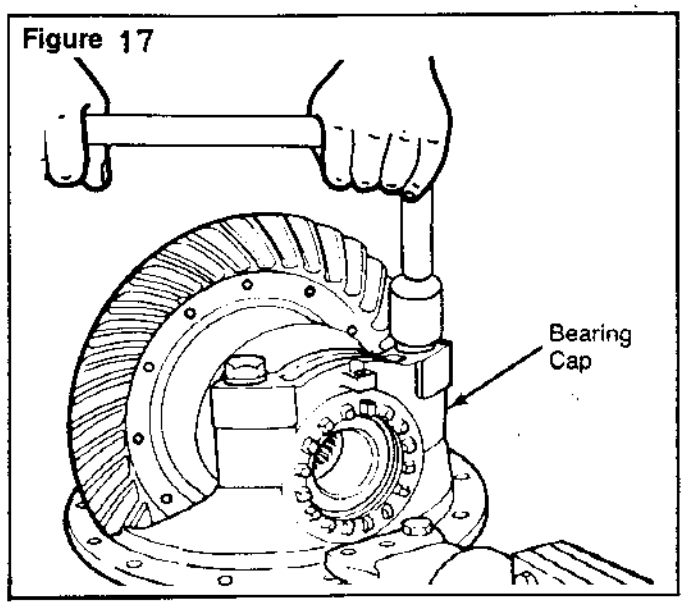


22. REMOVE COTTER PINS USING A SMALL DRIFT AND HAMMER. FIG.16

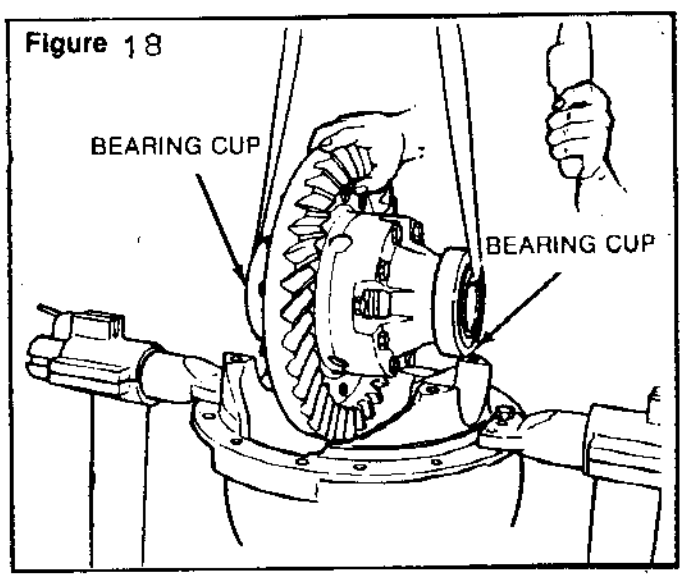



23. REMOVE CAPSCREWS AND WASHERS OF BEARING CAPS. FIG.17

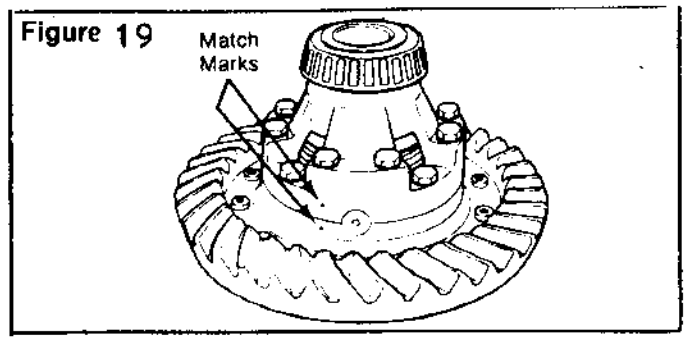
- REMOVE BEARING ADJUSTING RINGS




24. LIFT THE DIFFERENTIAL CASE & RING GEAR ASSEMBLY FIG.18

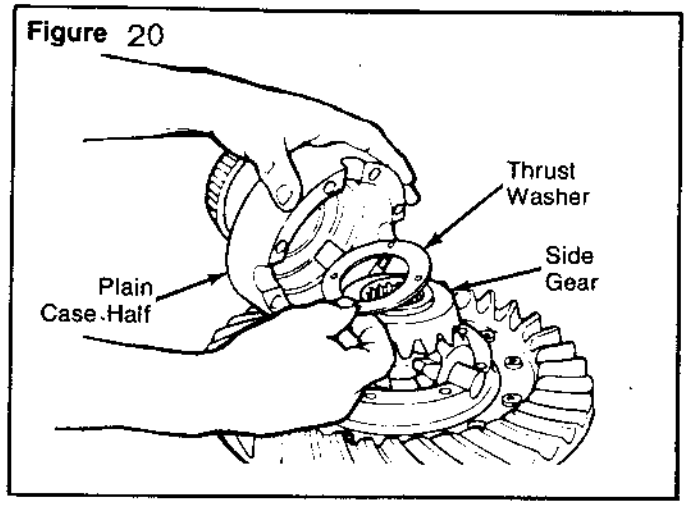


25. MAKE MATCH MARKS ON THE DIFF.CASE HALVES. FIG.19



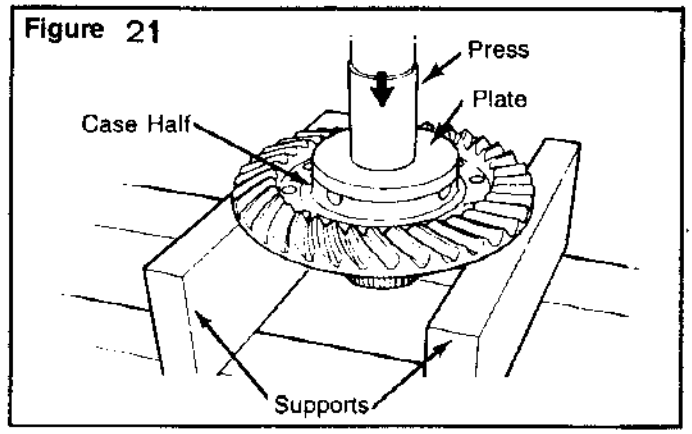

26. REMOVE THE DIFF.CASE BOLTS.

- o SEPERATE CASE HALVES.
- o REMOVE SPIDER,PINIONS,SIDE GEARS AND THRUST WASHERS.FIG.20

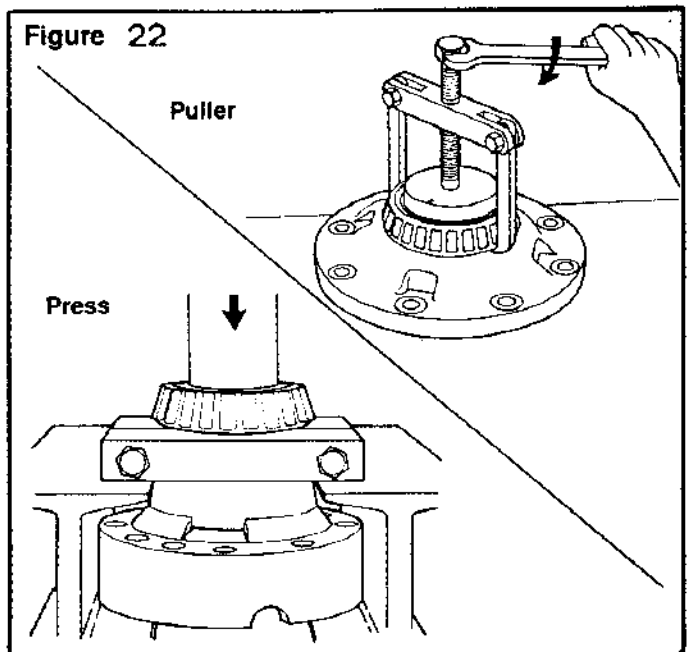



27. REMOVE THE RING GEAR BOLTS,NUTS AND WASHERS.

- o REMOVE THE RING GEAR FROM DIFF.CASE USING A PRESS FIG.21




28. REMOVE THE BEARINGS FROM DIFF.CASES USING BEARING PULLER/ PRESS FIG.22

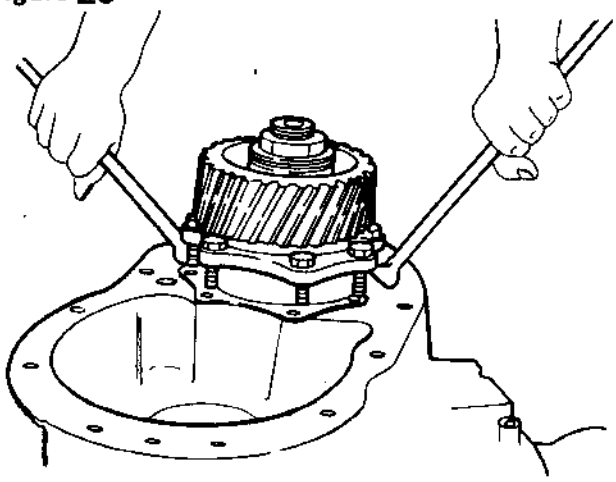


29. LOOSEN PINION CAGE CAPSCREWS ALTERNATIVELY AND UNIFORMLY, UNTIL CAPSCREWS TOUCH THE BACKFACE OF THE HELICAL GEAR.

- LIFT THE ASSY. USING PRYBARS FIG.23

- REMOVE SHIMS, MEASURE AND KEEP THEM INTACT .

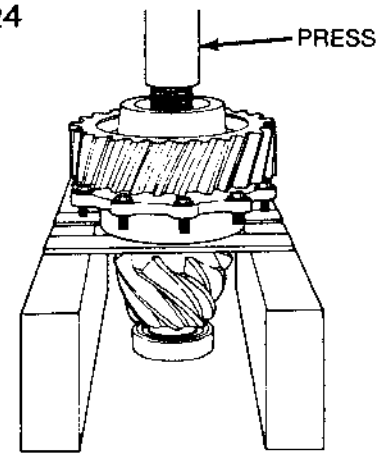
Figure 23



30. REMOVE PINION NUT AND WASHER.

- PRESS THE PINION THRU BRG.CAGE FIG.24

Figure 24




31. REMOVE OUTER BEARING, SPACER FROM THE CAGE.

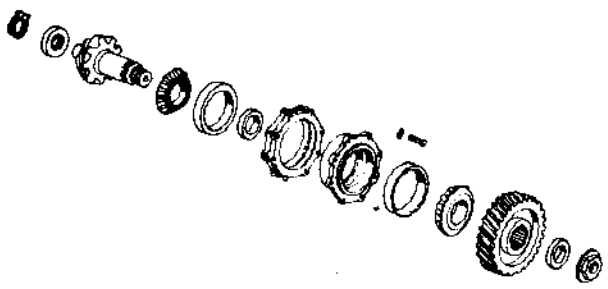
- REMOVE PINION INNER BEARING USING A PULLER.

- REMOVE SNAP RING ,REMOVE SPIGOT BRG.USING A PULLER.

- IF NECESSARY REMOVE BRG.CUPS USING PULLERS.

- REFER FIG.25 FOR DETAILS OF PINION CAGE ASSY.

Figure 25



## III. CLEANING AND INSPECTION OF PARTS

1. USE KEROSENE OR DIESEL TO WASH THE PARTS.

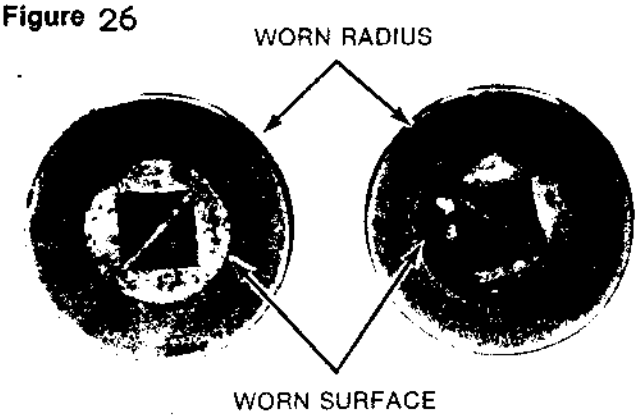
- o DRY THE PARTS IMMEDIATELY AFTER CLEANING
- o APPLY AXLE LUBRICANT/RUST PREVENTIVE OVER THE REUSABLE PARTS TO PREVENT RUST AND CORROSION.

2. INSPECT ROLLER BRGS.REPLACE IF ANY OF THE FOLLOWING CONDITIONS EXIST.

i> CENTRE OF BIGGER END OF ROLLERS WORN TO THE LEVEL OR BELOW THE OUTER SURFACE FIG.26

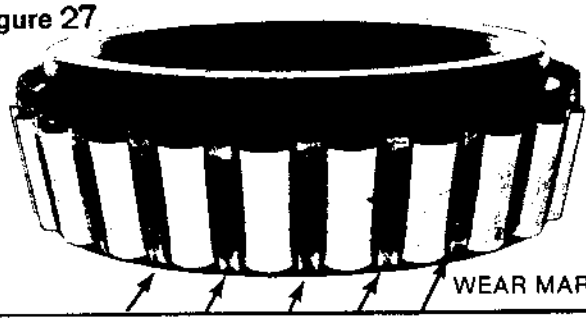
ii> RADIUS AT THE BIGGER END OF THE ROLLERS WORN OUT SHARPLY FIG.26.

Figure 26



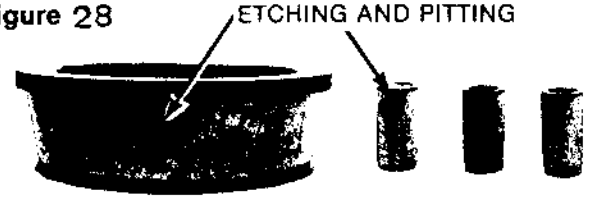

iii>BRIGHT WEAR MARK ON THE OUTER SURFACE OF ROLLER CAGE FIG.27

Figure 27

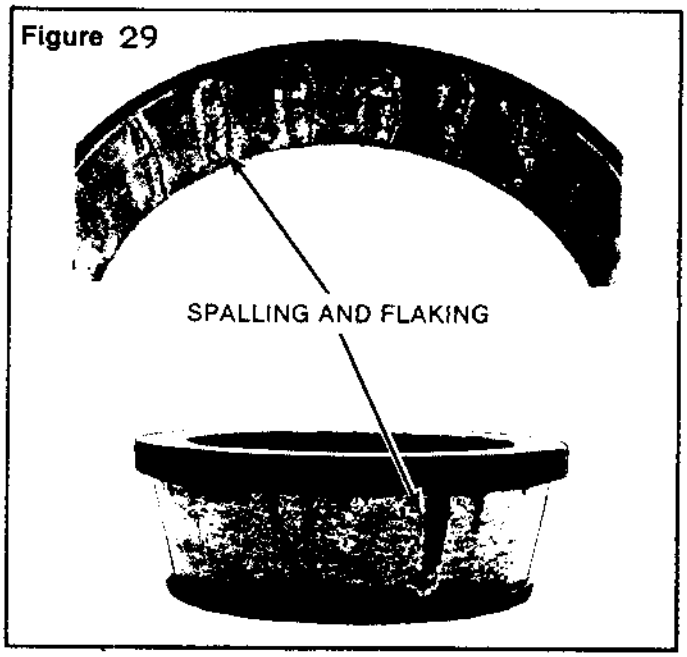



iv> ETCHING AND PITTING MARKS ON ROLLER AND ON CONTACT SURFACES. FIG.28

Figure 28

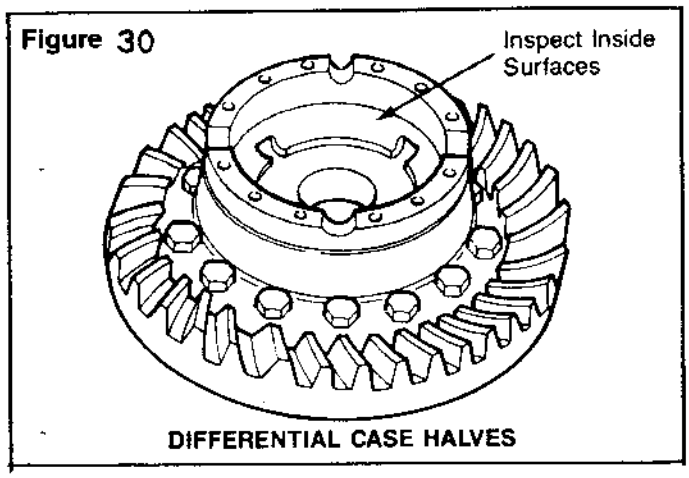


v> SPALLING AND FLAKING MARKS ON THE CUP AND CONE INNER RACE SURFACES.FIG.29




3. INSPCT THE FOLLOWING PARTS FOR WEAR OR STRESS.

i> INSIDE SURFACES OF DIFF.CASE HALVES.FIG.30

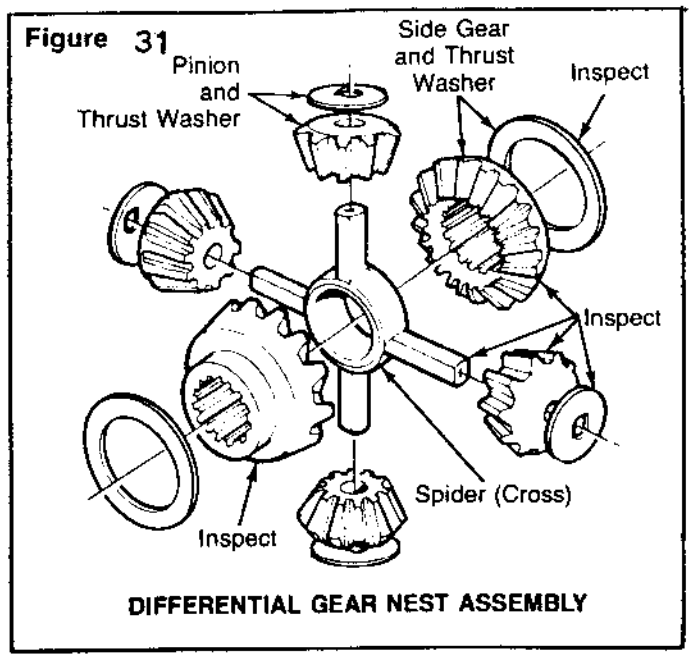



ii> BOTH SURFACES OF ALL THRUST WASHERS.FIG.31

iii>FOUR TRUNION ENDS OF SPIDER

iv> TEETH AND SPLINES OF SIDE GEAR

v> TEETH AND BORE OF DIFF PINIONS




4. o **INSPECT HELICAL GEARS FOR WEAR,RIDGE,PITTING AND SCORING AND REPLACE IF NECESSARY.**

o **HELICAL GEARS SHOULD BE REPLACED IN SET ONLY.**

# IV. ASSEMBLY

## A. MAIN DIFFERENTIAL

- BEFORE INSTALLING A NEW GEAR SET, ENSURE SET NUMBER ETCHED ON THE RING GEAR AND THE PINION ARE SAME.

- LOCATION OF MARKS ARE AS SHOWN IN FIG.32

A> TOOTH COMBINATION NUMBER(6 x 35)

B> SET NUMBER

C> PINION CONE VARIATION NUMBER

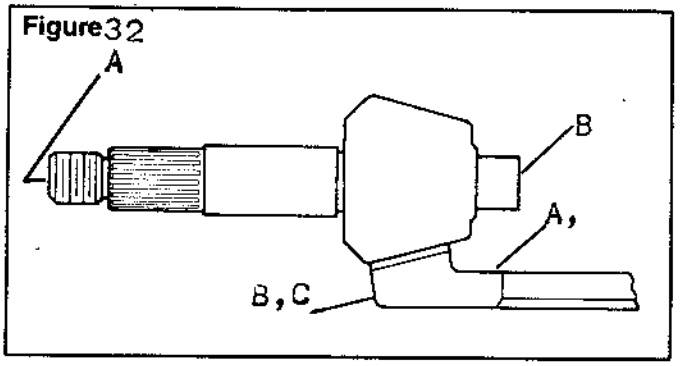


Figure 32

1. PRESS INNER AND OUTER BRG. CUPS INTO BRG. CAGE USING CORRECT SLEEVES. FIG.33

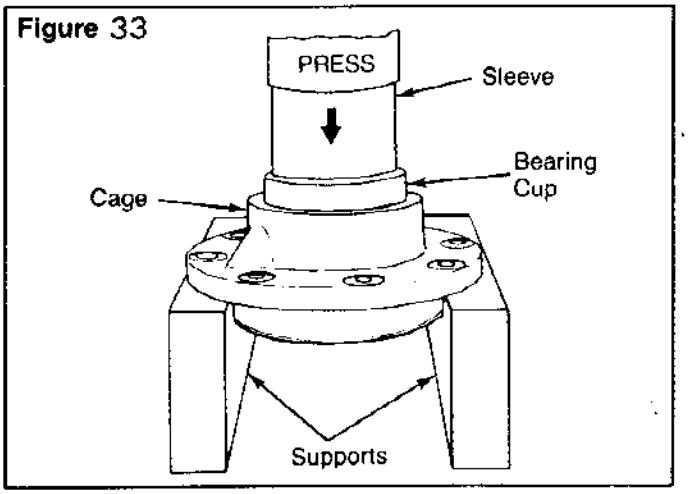


Figure 33

2. PRESS THE INNER BRG.CONE ON THE PINION TILL IT SITS FIRMLY.FIG.34

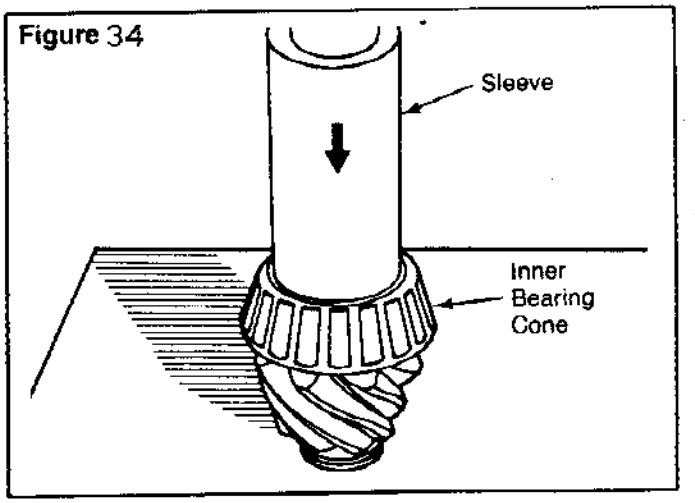
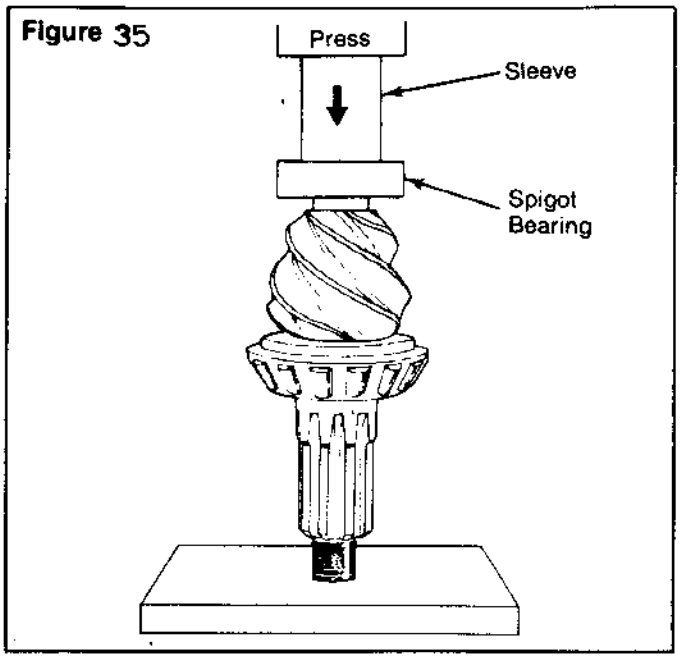
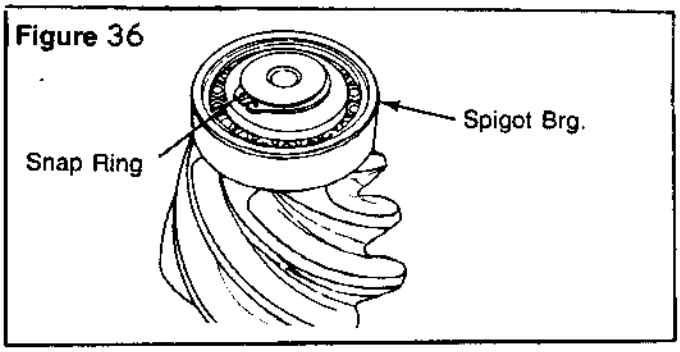


Figure 34

3. PRESS THE SPIGOT BEARING ON THE END OF DRIVE PINION FIG.35.

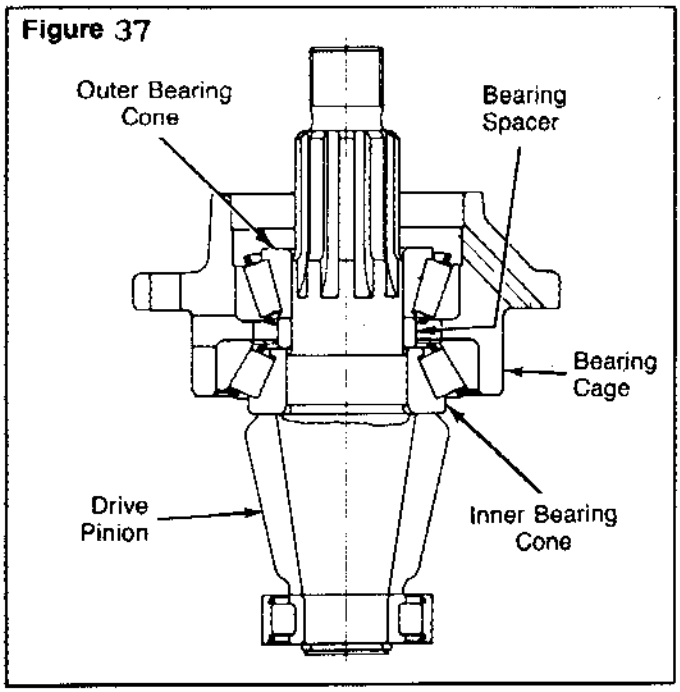



4. INSTALL THE SNAP RING INTO THE GROOVE.FIG.36




5. POSITION THE BRG.CAGE OVER INNER BRG.CONE.

- o APPLY AXLE LUBRICANT ON BRGS.
- o INSTALL THE BRG.SPACERS.
- o PRESS THE OUTER BRG.CONE ON THE PINION TILL IT SITS FIRMLY ON THE SPACER FIG.37.



6. CHECK AND CORRECT THE PRELOAD OF PINION BRGS. ADOPTING FOLLOWING PROCEDURE.

- PLACE THE PINION CAGE ASSY IN A PRESS.
- INSTALL A SLEEVE ON OUTER BEARING.
- APPLY 54,000 LBS (27 TONS) PRESSURE.
- WHILE PRESSURE IS HELD, WIND A CORD AROUND THE CAGE WITH THE SPRING SCALE. FIG.38

(IF THE PRESS IS NOT AVAILABLE INSTALL COMPANION FLANGE AND TIGHT PINION NUT TO THE TORQUE OF 800-1100 FT.LBS.)

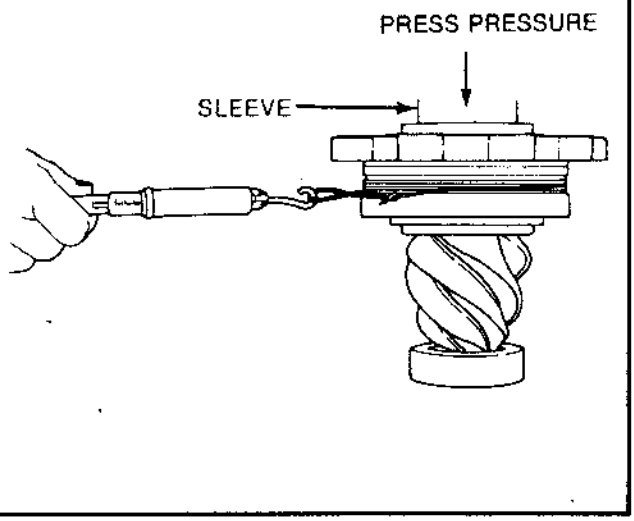
- PULL THE CORD ON HORIZONTAL LINE. AS THE CAGE ROTATES READ THE SCALE.
- SPRING SCALE SHOULD READ BETWEEN 2.50 TO 5.5 KGS.
- IF THE SCALE READING IS NOT WITHIN THE SPECIFICATION :

A) TO INCREASE PRELOAD REDUCE BRG.SPACER THICKNESS.

B) TO REDUCE PRELOAD INCREASE BRG.SPACER THICKNESS.

(TO ACHEIVE DESIRED PRELOAD, SELECT AND USE TWO SPACERS FROM SPACER KIT)

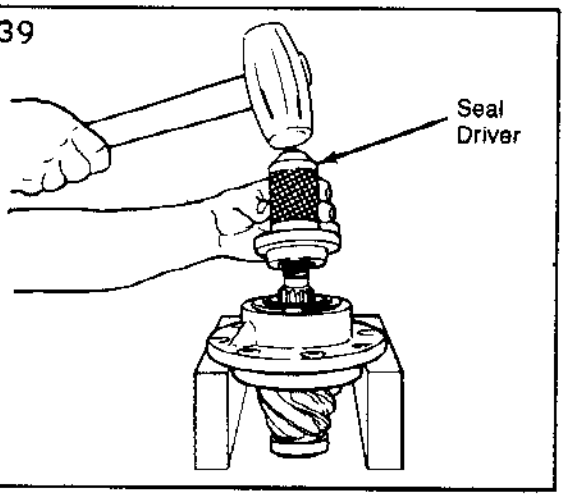
Figure 38




7. APPLY GREASE TO THE OIL SEAL LIPS AND THE CAVITY BETWEEN LIPS.

- USE A MALLET AND THE SLEEVE TO INSTALL THE SEAL.FIG.39

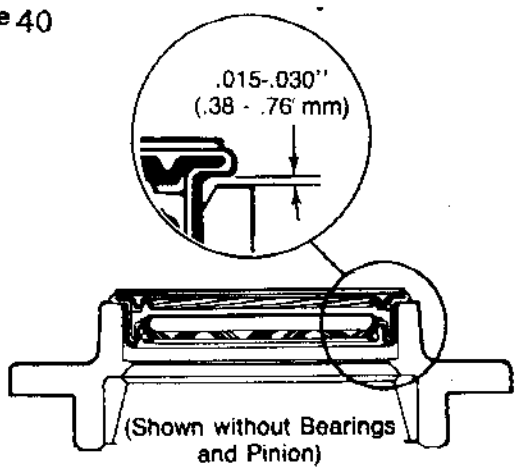
Figure 39




8. AFTER TRIPLE-LIP SEAL IS INSTALLED CHECK GAP FIG.40

- GAP MUST BE WITHIN 0.015" TO 0.030". THE DIFFERENCE BETWEEN SMALLEST AND LARGEST GAP SHOULD NOT EXCEED 0.010"

Figure 40



9. INSTALL THE MOUNTING CAPSCREWS AND WASHERS IN THE PINION CAGE.

- o PRESS THE PINION HELICAL GEAR TILL IT TOUCHES PINION OUTER BEARING.

- o INSTALL WASHER AND PINION LOCK NUT.TIGHTEN THE PINION NUT TO THE TOQRUE OF 900-1200 Lb.Ft.

10. IF ORIGINAL GEAR SET IS REUSED INSTALL THE ORIGINAL SHIM PACK.

- o IF NEW GEAR SET IS USED,ADJUST SHIM PACK ADOPTING FOLLOWING PROCDURE.

A) NOTE PINION CONE VARIATION No.ETCHED ON REMOVED GEAR.

B) IF THIS IS A PLUS(+),SUBTRACT (-) THE No. FROM OLD SHIM PACK THICKNESS.

OR

IF IT IS MINUS(-),ADD(+) THE No.TO OLD SHIM PACK THICKNESS.

C) THE VALUE ARRIVED AS ABOVE ,IS THE STANDARD SHIM PACK.

D) IF PINION CONE VARIATION No. OF NEW GEAR SET IS MINUS(-), SUBTRACT THE No.FROM STANDARD SHIM PACK ARRIVED AS ABOVE.

OR

IF IT IS PLUS(+), ADD TO STANDARD PACK THICKNESS.

REFER EXAMPLES - CHART 1.

11. INSTALL PINION ASSY WITH THE ABOVE SHIM PACK INTO DIFFERENTIAL CARRIER FIG.41

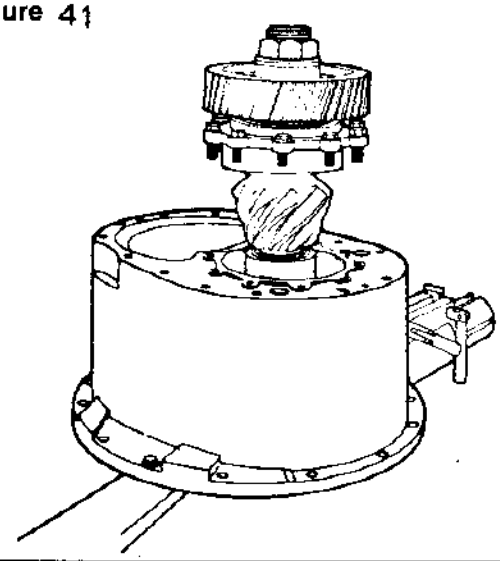
- o ALIGN THE CAPSCREWS WITH THEIR HOLES.

- o TIGHTEN CAPSCREWS UNIFORMLY AND ALTERNATIVELY SO THAT PINION CAGE SITS FIRMLY. TIGHTEN TO THE TORQUE OF 85-100 lb.Ft.

CHART I

| Examples: | Inches |
|---|---|
| 1. Old Shim Pack Thickness | .030 |
| Old PC Number, PC + 2 | − .002 |
| Standard Shim Pack Thickness | .028 |
| New PC Number, PC + 5 | + .005 |
| New Shim Pack Thickness | .033 |
| 2. Old Shim Pack Thickness | .030 |
| Old PC Number, PC − 2 | + .002 |
| Standard Shim Pack Thickness | .032 |
| New PC Number, PC + 5 | + .005 |
| New Shim Pack Thickness | .037 |
| 3. Old Shim Pack Thickness | .030 |
| Old PC Number, PC + 2 | − .002 |
| Standard Shim Pack Thickness | .028 |
| New PC Number, PC − 5 | − .005 |
| New Shim Pack Thickness | .023 |
| 4. Old Shim Pack Thickness | .030 |
| Old PC Number, PC − 2 | + .002 |
| Standard Shim Pack Thickness | .032 |
| New PC Number, PC − 5 | − .005 |
| New Shim Pack Thickness | .027 |

Figure 41

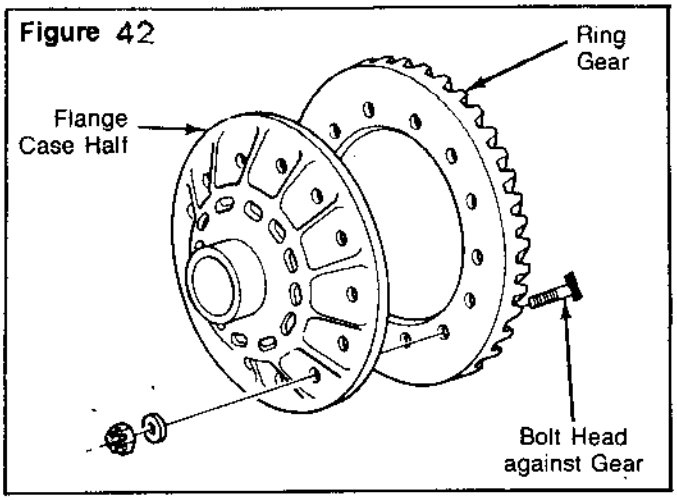


12. HEAT THE RING GEAR IN A WATER/ OIL BATH TO ABOUT 170°F(80°C) FOR 15 MINUTES.

13. INSTALL THE RING GEAR ON FLANGE HALF IMMEDIATELY ALIGHINING MOUNTING HOLES. FIG.42

14. INSTALL MOUNTING BOLTS,WASHERS AND NUTS.

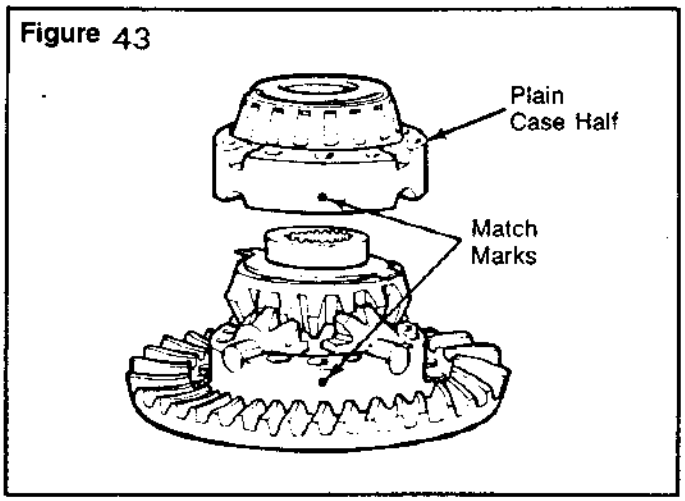
- TIGHTEN THE NUTS TO THE TORQUE OF 180-230 FT.LBS




15. INSTALL THE BRG.CONES ON BOTH DIFF.CASES.

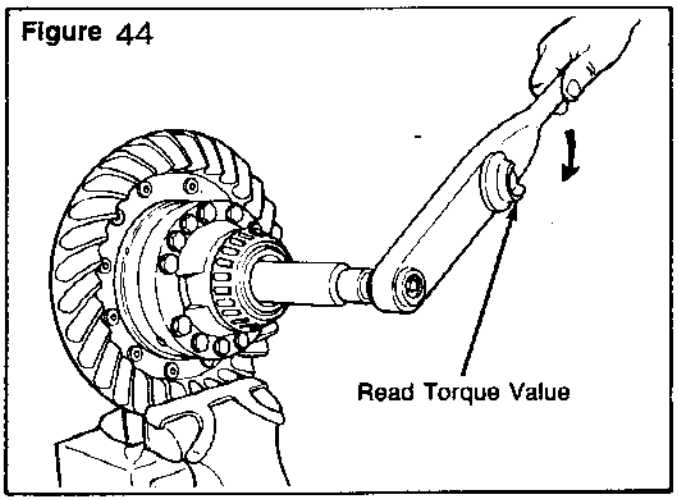
16. INSTALL SPIDER,SIDE GEAR, DIFF. PINIONS AND THRUST WASHERS INTO FLANGE HALF.

- INSTALL PLAIN HALF ALIGNING MATCH MARKS FIG.43
- TORQUE TIGHTEN THE DIFF.CASE BOLTS TO 85-115 FT.LBS

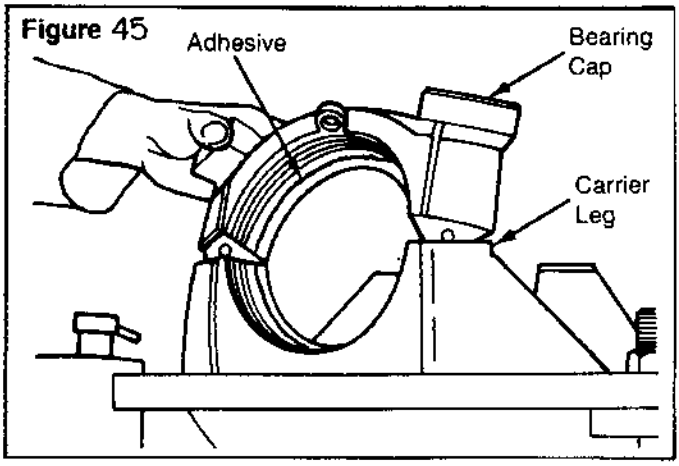



17. CHECK THE ROTATING RESISTANCE OF DIFF. GEARS FIG.44

- RECOMMENDED TORQUE IS 5-20 FT.LBS.
- IF TORQUE IS MORE,CHECK CASE HALVES,SPIDER,DIFF.GEARS, THRUST WASHERS.REPLACE THE PARTS AS NECESSARY.

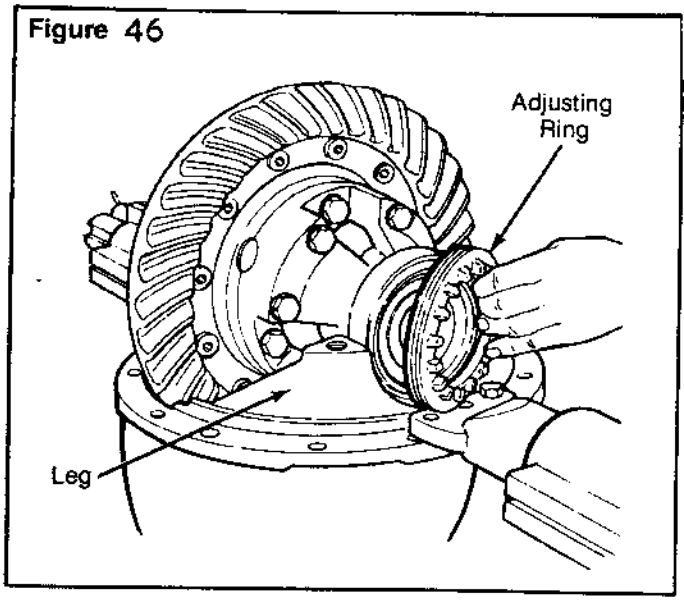


18. APPLY ADHESIVE TO BRG.BORES. FIG.45



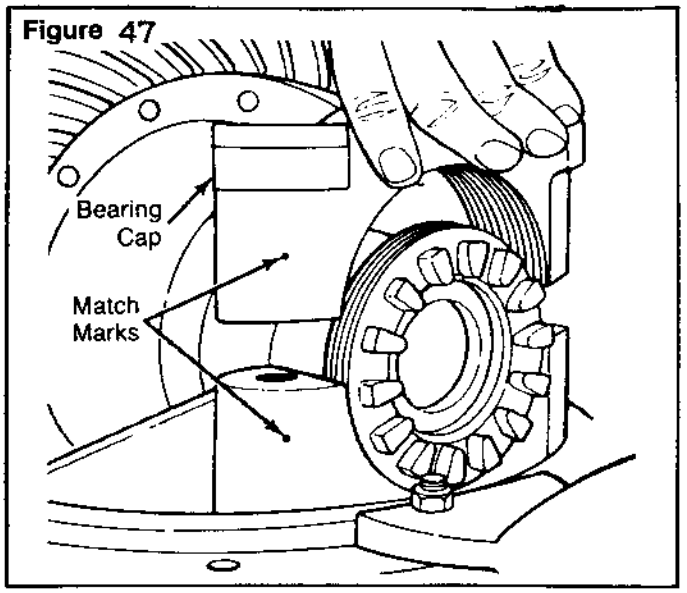

19. INSTALL DIFF.ASSY.INTO THE CARRIER.

- INSTALL BOTH SIDE ADJ.RINGS AND HAND TIGHTEN TILL THESE THOUCHES THE DIFF BRGS FIG.46

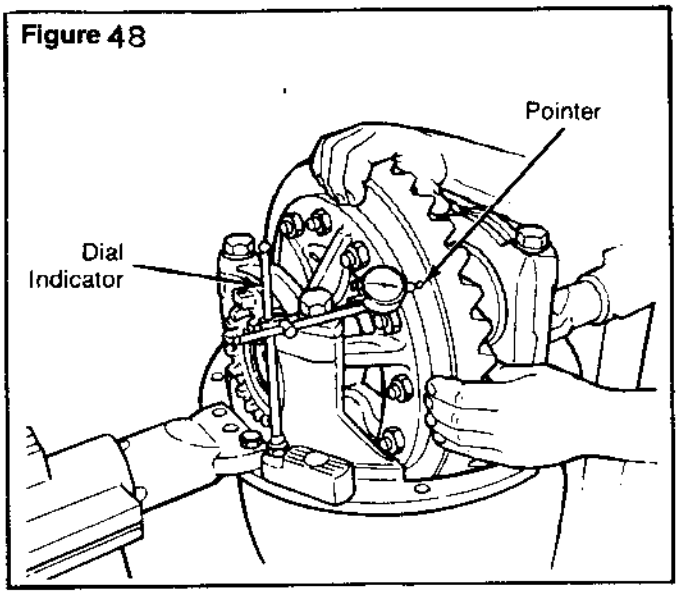



20. INSTALL THE BRG.CAPS ALIGNING THE MATCH MARKS. FIG.47

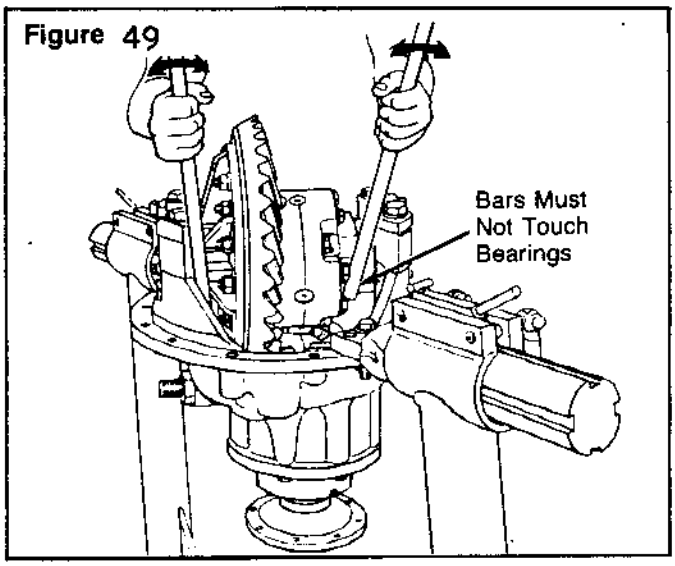
- TIGHTEN THE BRG.CAP BOLTS UNTIL THE BOLT HEAD SITS ON THE BRG.CAPS



21. ATTACH A DIAL INDICATOR SO THAT THE PLUNGER IS AGAINST THE BACK FACE OF THE RING GEAR. FIG.48

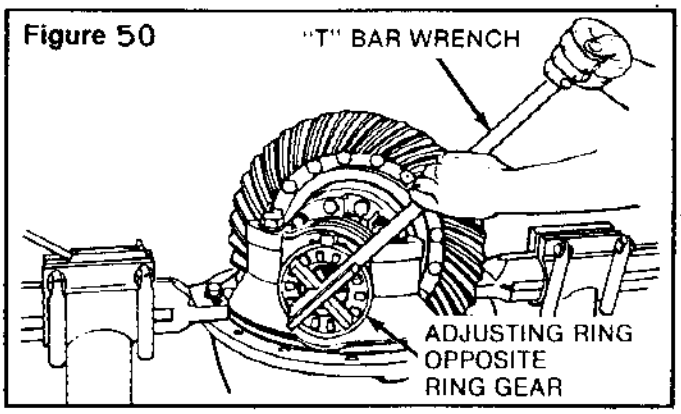



22. MOVE THE DIFFERENTIAL TO THE LEFT AND RIGHT WITH PRY BARS AND ENSURE SMALL AMOUNT OF END PLAY FIG.49




23. TIGHTEN THE ADJ.RING OPPOSITE TO RING GEAR TILL THE INDICATOR SHOWS ZERO END PLAY. FIG.50

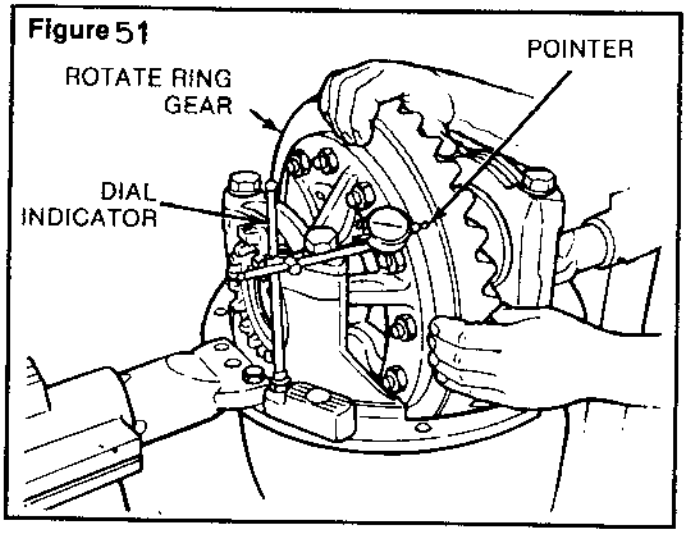
24. TIGHTEN BOTH ADJ.RINGS ONE NOTCH TO PRELOAD THE DIFF.BRGS.



25. ADJUST DIAL INDICATOR TO ZERO.

- o ROTATE THE RING GEAR TO CHECK THE RUN OUT.FIG.51
- o RUN OUT SHOULD BE WITHIN 0.008" (0.20 mm)

Figure 51




26. ATTACH DIAL INDICATOR SO THAT THE PLUNGER IS ON THE DRIVE SIDE OF THE TOOTH. FIG.52

- o ADJUST THE BACKLASH BY LOOSENING THE ONE OF THE ADJ.RINGS AND TIGHTENING THE OTHER ADJ.RING TO THE EQUAL AMOUNT

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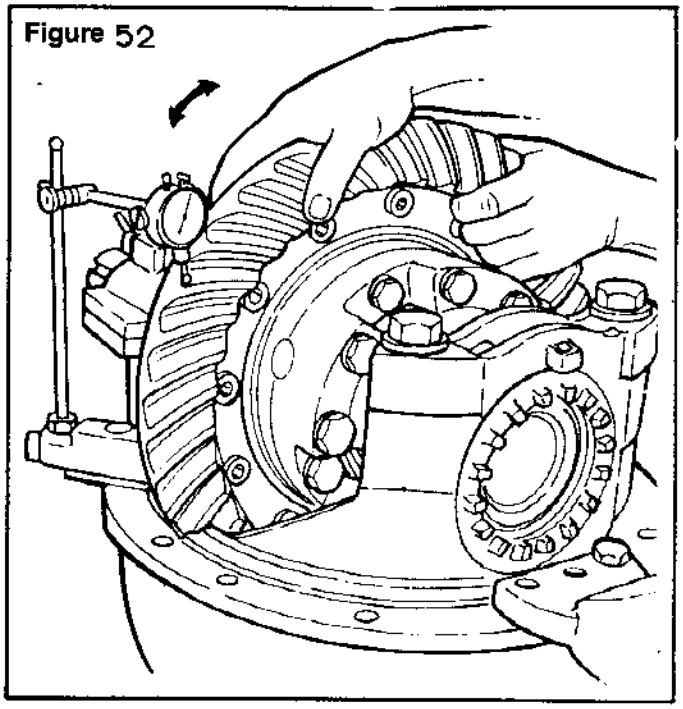
Figure 52



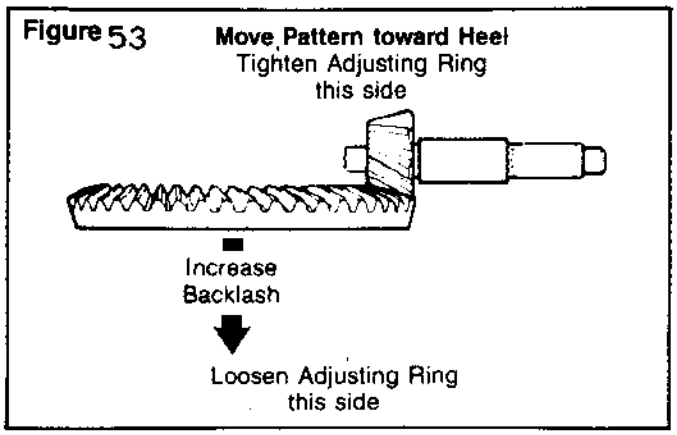
BACKLASH SPECIFICATION :

BACKLASH RANGE = 0.008" - 0.018" (0.20 - 0.46 mm)

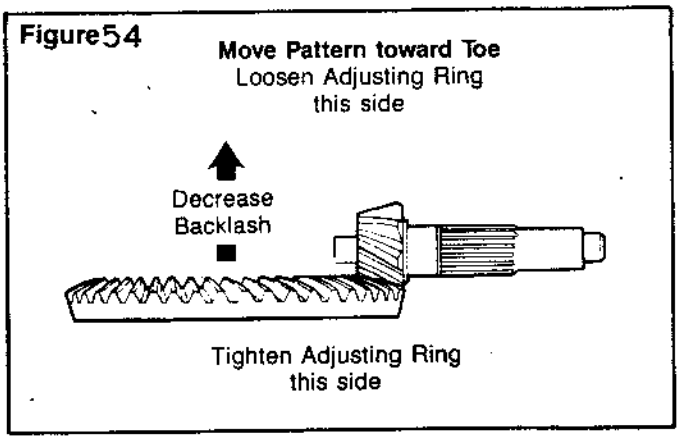
- BACKLASH FOR NEW GEAR SET = 0.012" (0.30 mm)

- WHILE REUSING OLD GEAR SET ADJUST THE BACKLASH NOTED DURING DISASSEMBLY.

27. TO INCREASE BACKLASH MOVE THE RING GEAR AWAY FROM THE DRIVE PINION. FIG.53

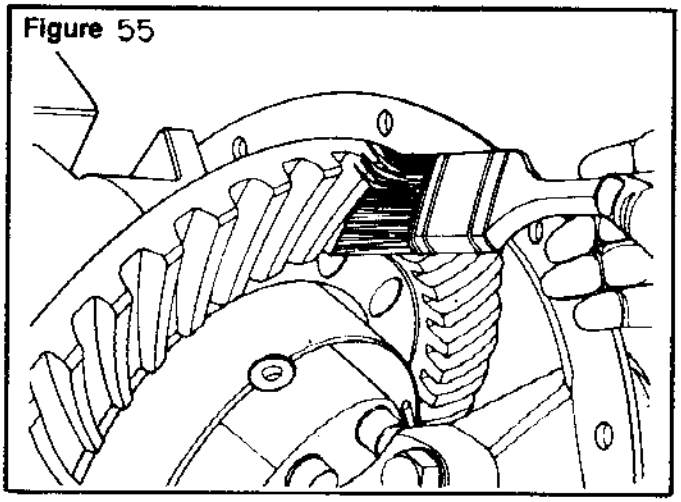



28. TO DECREASE BACKLASH MOVE THE RING GEAR TOWARDS THE DRIVE PINION. FIG.54



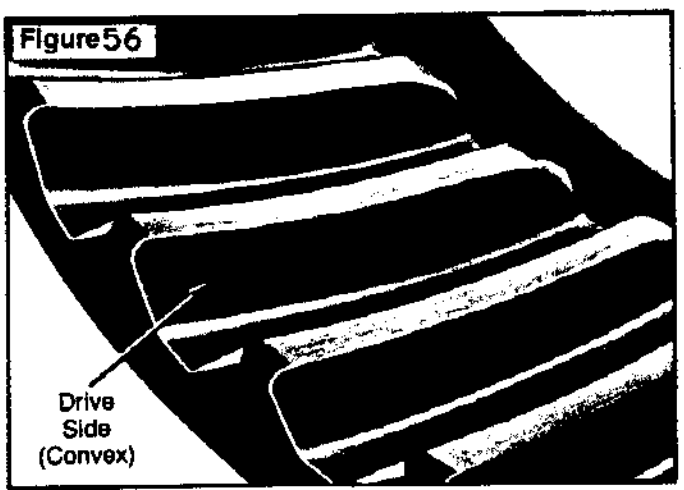

29. APPLY MARKING COMPOUND TO SIX TEETH OF RING GEAR.

- ROTATE THE RING GEAR FORWARD AND BACKWARD SO THAT THESE TEETH GO PAST PINION TO OBTAIN CLEAR PATTERN.FIG.55

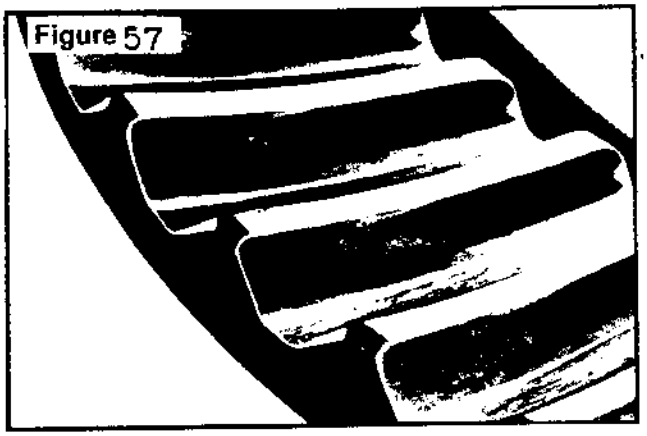



30. COMPARE THE PATTERN TO FIGS.56,57 & 58

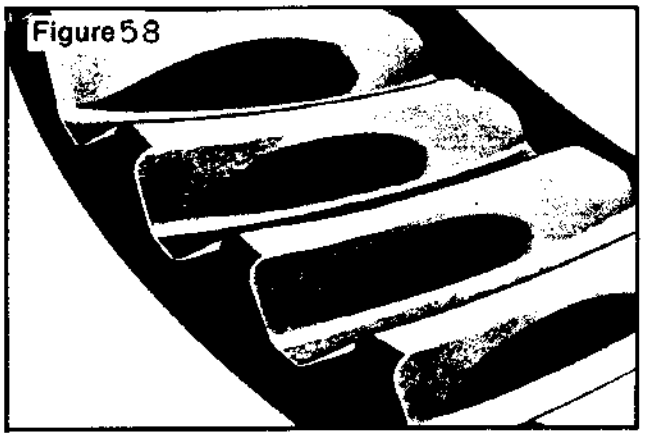
- GOOD CONTACT PATTERN - TOWARDS THE THE TOE OF THE GEAR TEETH AND IN CENTRE BETWEEN TOP AND BOTTOM OF TEETH FIG.56



o HIGH PATTERN - THIS INDICATES THAT THE DRIVE PINION IS NOT INSTALLED DEEP ENOUGH INTO THE CARRIER. FIG.57

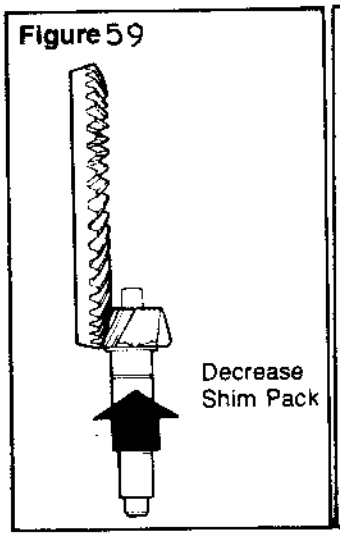



o LOW PATTERN - THIS INDICATES THAT THE DRIVE PINION IS INSTALLED TOO DEEP ENOUGH IN THE CARRIER. FIG.58

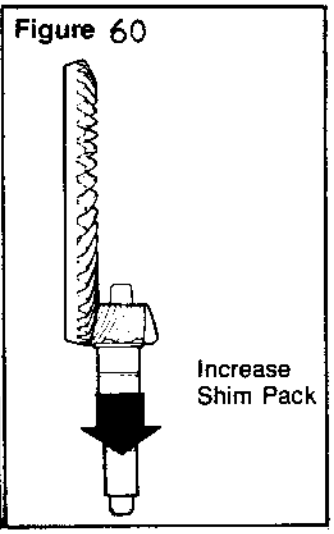



31. TO CORRECT THE PATTERN PROCEED AS FOLLOWS.

o HIGH PATTERN- DECREASE THE THICKNESS OF SHIM PACK UNDER BEARING CAGE. THIS WILL MOVE THE PINION TOWARDS RING GEAR. FIG.59.

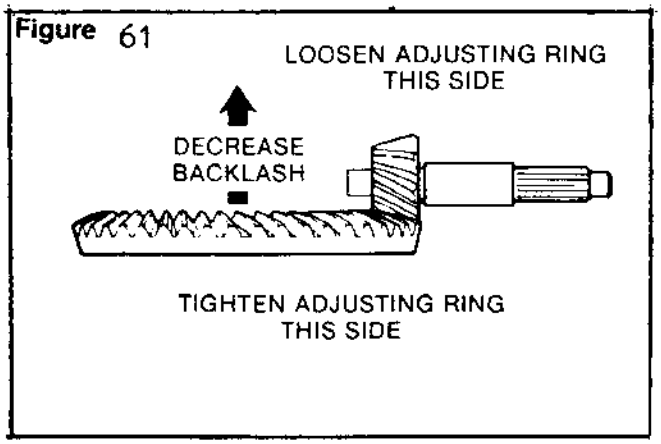



o LOW PATTERN - INCREASE THE THICKNESS OF SHIM PACK UNDER BEARING CAGE. THIS WILL MOVE THE PINION AWAY FROM RING GEAR.FIG.60




32. LOCATION OF PATTERNS - TO MOVE THE CONTACT PATTERNS TO THE CORRECT LOCATION IN THE TEETH, ADJUST THE BACKLASH WITHIN SPECIFIED RANGE AS FOLLOWS.

o TO SHIFT THE PATTERN TOWARDS TOE OF THE TEETH DECREASE THE BACKLASH. FIG.61



o TO SHIFT THE PATTERN TOWARDS HEEL INCREASE THE BACKLASH. FIG.62

33. TORQUE TIGHTEN THE BRG. CAP BOLTS TO THE VALUE OF 290-350 FT.LBS.

34. INSTALL THE COTTER PINS IN THE ADJ. RINGS USING A DRIFT AND HAMMER FIG.63

35. INSTALL THE THRUST SCREW AND TIGHTEN UNTIL IT TOUCHES THE RING GEAR.

o LOOSEN THE THRUST SCREW 1/2 TURN (180°) FIG.64. CLEARANCE BETWEEN THRUST SCREW AND RING GEAR SHOULD BE 0.025" - 0.045"(0.65-1.14 mm)

o TIGHTEN JAM NUT TO THE TORQUE OF 150-190 FT.LBS.

Figure 62

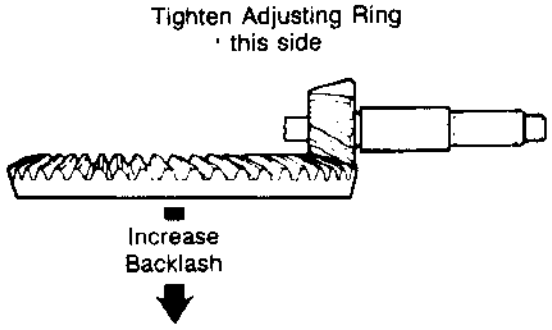



Figure 63

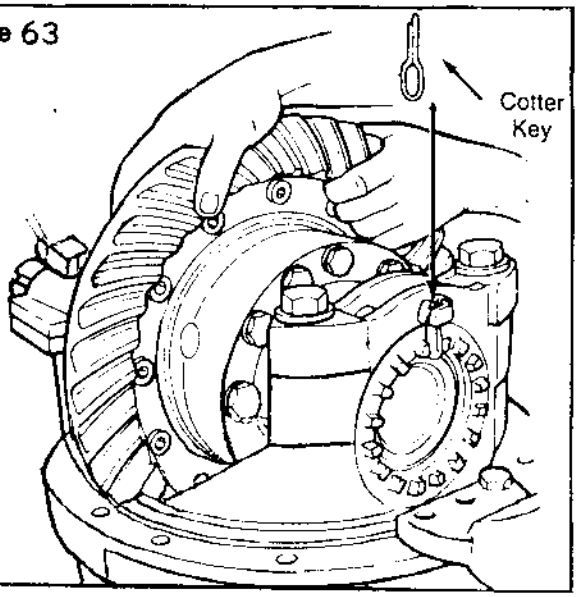
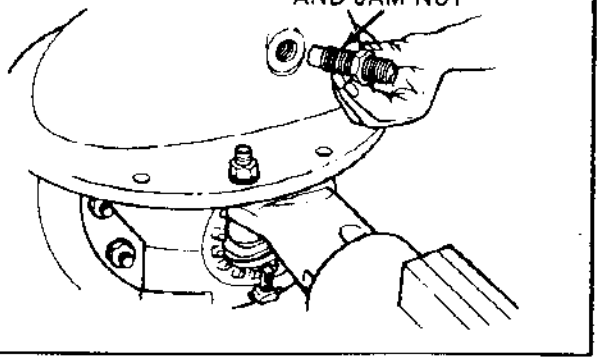
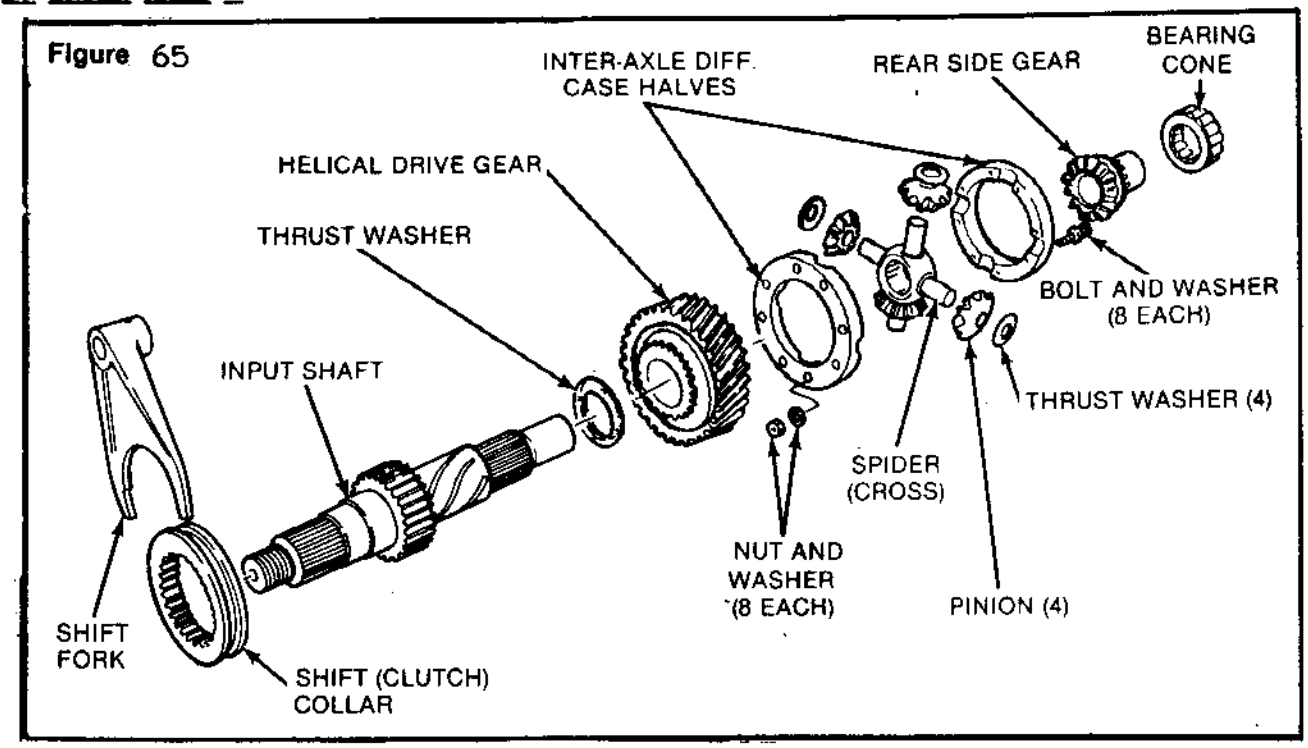



Figure 64



B. INTER AXLE :

Figure 65



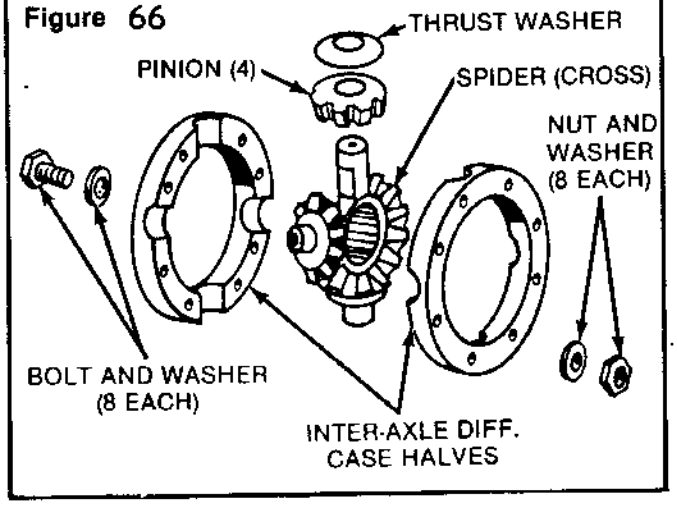

36. PRESS INPUT SHAFT BRG.CUP INTO DIFF.CARRIER.

- PRESS BRG.CONE ONTO REAR SIDE GEAR.

37. INSTALL REAR SIDE GEAR INTO CARRIER.

38. LUBRICATE CASE HALVES,SPIDER, PINION AND THRUST WASHERS FIG.66

Figure 66



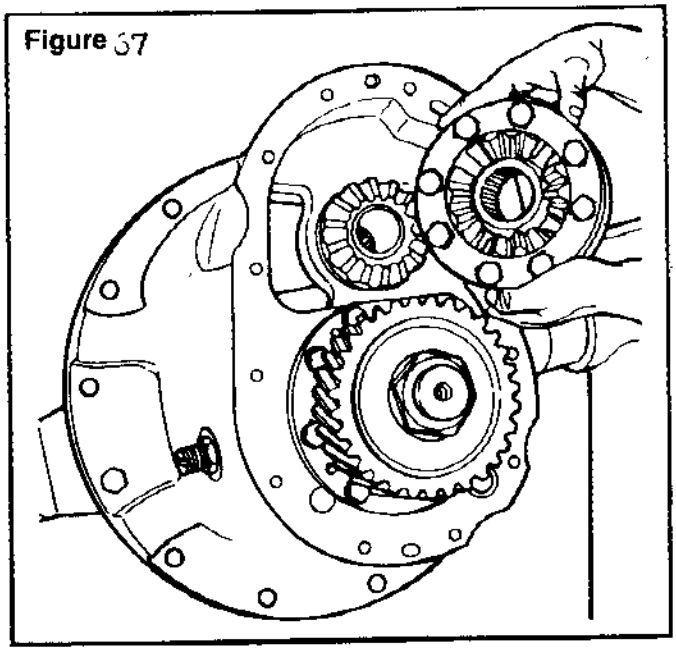

39. ASSEMBLE SPIDER,PINIONS AND THRUST WASHERS INTO ONE CASE HALF.

- POSITION OTHER CASE HALF ALIGNING MATCH MARKS.

- INSTALL CAPSCREWS,WASHERS AND NUTS.TIGHTEN TO THE TORQUE OF 35-50 Lb.Ft.

40. INSTALL INTER AXLE ASSY.INTO CARRIER OVER THE REAR SIDE GEAR. FIG.67

Figure 67

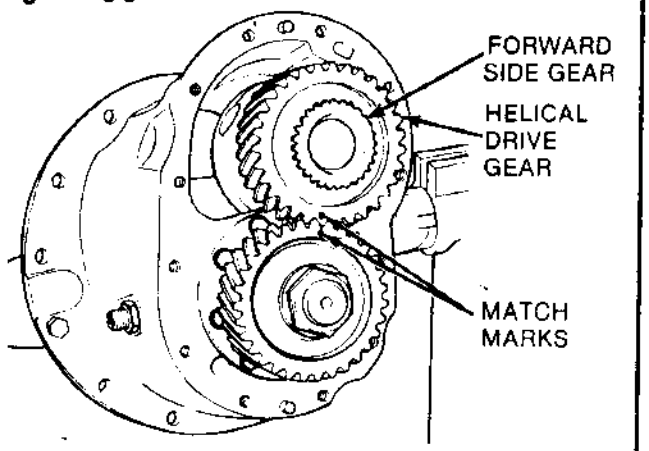


- ENSURE BOLT HEAD FACES REAR SIDE GEAR.

41. ALIGNING MATCH MARKS INSTALL FORWARD SIDE GEAR OVER INTER-AXLE DIFF.CASE. FIG. 68

o ENSURE GEARS ARE ROTATING FREELY.

Figure 68




NOTE:

o IF HELICAL DRIVE GEAR IS TO BE REPLACED, BOTH DRIVE AND DRIVEN GEARS MUST BE REPLACED AS A SET.

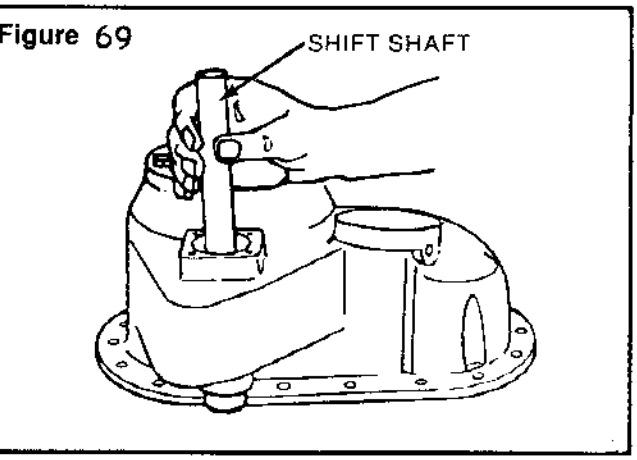
C. HELICAL COVER.

42. POLISH THE SHIFT SHAFT WITH FINE EMERY TO REMOVE ANY ROUGH AREAS.

43. USING A SOFT MALLET TAP THE SHIFT SHAFT PARTIALLY IN THE GEAR COVER.FIG.69

o WHILE DOING SO, ENSURE SMALL DIA OF SHAFT ENTERS FIRST.

Figure 69

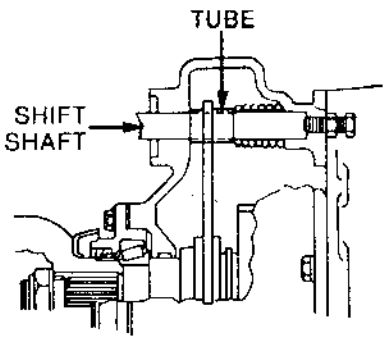



44. HOLD THE FORK IN CORRECT POSITION INSIDE THE COVER.

o TAP THE SHAFT FURTHER UNTIL IT SUPPORTS THE FORK.

45. HOLD RETURN SPRING IN POSITION, CONTINUE TO TAP THE SHAFT TILL IT ENTERS THE REAR BORE. FIG.70

Figure 70

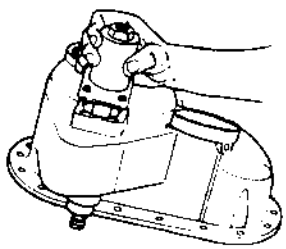



46. INSTALL THE STOP SCREW AND JAM NUT IN THE BACK OF THE GEAR COVER.

- TIGHTEN THE STOP SCREW JUST TWO TURNS ONLY. FIG.70

47. INSTALL THE SHIFT UNIT.TIGHTEN SOCKET HEAD CAPSCREWS TO THE TORQUE OF 7 11 Lb.Ft.FIG.71

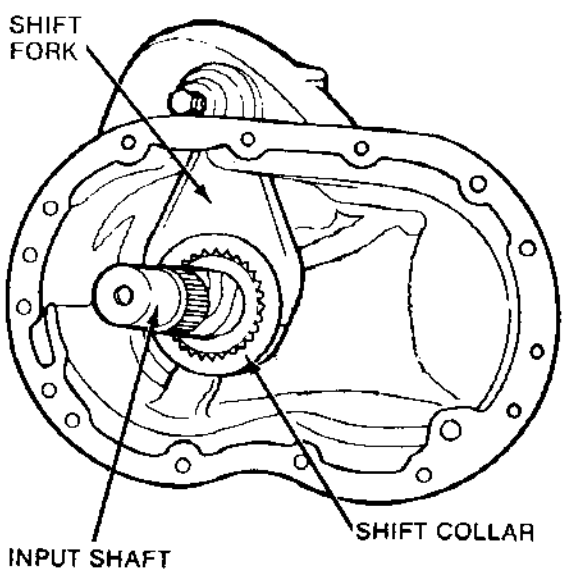
Figure 71



48. POSITIONING SHIFT COLLER IN SHIFT FORK,PUSH THE INPUT SHAFT THRU THE COLLAR.

- ENSURE SHAFT ENGAGES WITH THE COLLAR SPLINES.FIG.72

Figure 72



49. PRESS THE FORWARD BEARING CONE ONTO THE INPUT SHAFT.FIG.73

50. PRESS THE BEARING CUP SQUARELY ONTO BEARING CAGE

51. APPLY WHEEL BRG.GREASE TO SEAL LIPS AND CAVITIES BETWEEN THE LIPS. FIG.74

- PRESS THE SEAL INTO BRG.CAGE UNTIL FLANGE OF SEAL IS FLAT AGAINST BRG.CAGE.

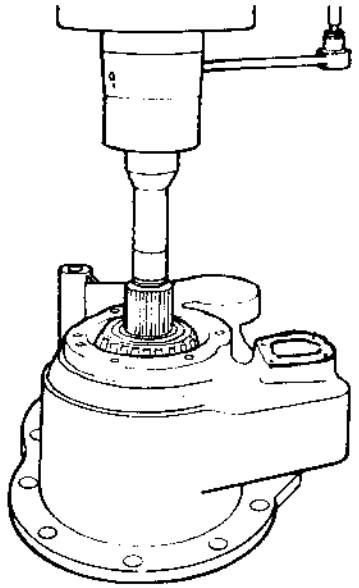
- CHECK GAP BETWEEN SEAL FLANGE AND BRG.CAGE.GAP MUST BE WITHIN 0.015" TO 0.030". DIFFERENCE BETWEEN SMALLEST AND LARGEST GAP MUST NOT EXCEED 0.010".FIG.75

52. IF ORIGINAL BEARING IS REUSED, ASSEMBLE THE BRG.CAGE WITH ORIGINAL SHIM PACK.

INSTALL CAPSCREWS AND WASHERS AND TIGHTEN TO THE TORQUE OF 60- 75 Lb.Ft.

52A. IF NEW BERAING IS USED,FOLLOW STEP 57 TO 62.TO ADJUST INPUT SHAFT END PLAY.

**Figure 73**



INSTALL FORWARD BEARING

**Figure 74**

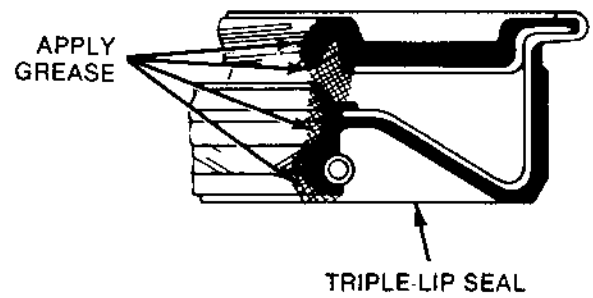
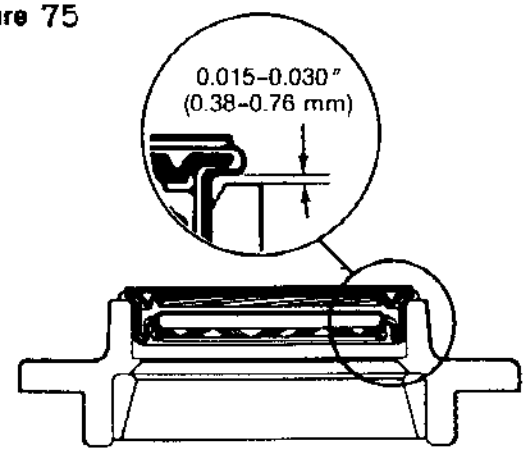



**Figure 75**




(SHOWN WITHOUT BEARINGS AND PINION)

53. APPLY WHEEL BRG.GREASE TO BOTH SIDES OF INPUT SHAFT THRUST WASHER AND WASHER CONTACTING SURFACE ON THE INPUT SHAFT. FIG.76.

54. INSTALL THRUST WASHER ON INPUT SHAFT. THE GREASE WILL HOLD WASHER FROM FALLING DOWN.

- WHILE INSTALLING WASHER,ENSURE THE RADIUS ON THE I.D. OF THE WASHER MATCHES WITH THE RADIUS OF THE INPUT SHAFT.FIG.77

55. APPLY A CONTINEOUS BEAD OF SILICONE GASKET MATERIAL ON MOUNTING SURFACE OF GEAR COVER AND AROUND FASTENERS HOLES.

56. ASSEMBLE GEAR COVER WITH THE CARRIER.

- WHILE INPUT SHAFT ENTERS INTER AXLE DIFFL.,IT MAY BE NECESSARY TO ROTATE THE SHAFT SIDE TO SIDE TO ALIGN SPLINES OF SPIDER AND SHAFT.

- WHEN THE COVER IS FULLY SEATED,ASSEMBLE WASHERS AND CAPSCREWS.

- TIGHTEN CAPSCREWS TO **85-115 FT.LBS.**

Figure 76

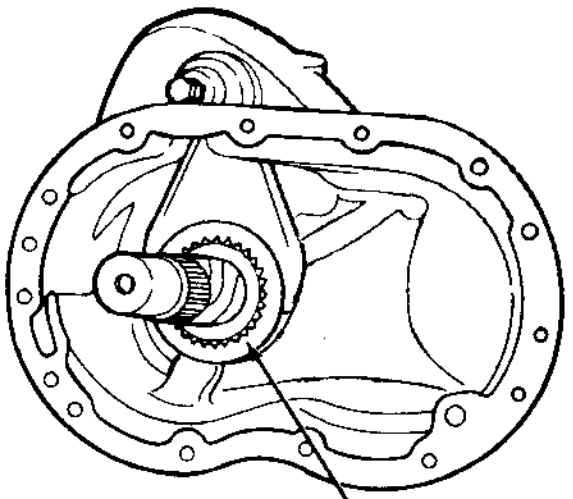
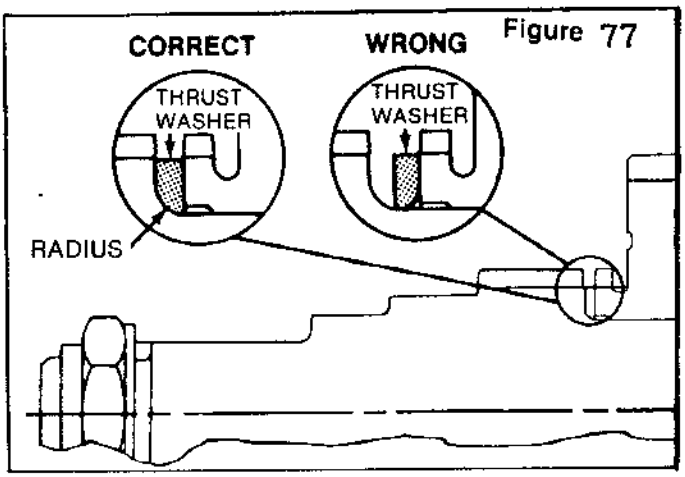



Figure 77



57. **IF NEW BEARING IS USED,ADOPT THE FOLLOWING PROCEDURE TO ARRIVE NEW SHIM PACK.**

- WITHOUT ANY SHIM,POSITION THE BRG.CAGE IN THE COVER.
- HAND TIGHTEN WASHERS AND CAPSCREWS.
- MEASURE GAP BETWEEN THE BRG. CAGE AND THE GEAR COVER USING A FEELER GUAGE. FIG.78
- ADD 0.005" TO THE MEASURED GAP TO ARRIVE AT REQUIRED SHIM PACK.

58. REMOVE BRG.CAGE AND REINSTALL WITH NEW SHIM PACK AS ARRIVED ABOVE.

- USE MINIMUM OF THREE SHIMS. ENSURE THINNEST SHIMS ARE ON THE OUTER SIDES OF PACK.

59. INSTALL WASHERS AND CAPSCREWS AND TIGHTEN TO THE TORQUE OF 60 - 75 Lb.Ft.

60. ASSEMBLE WASHER,COMP.FLANGE AND NUT ON THE INPUT SHAFT. TIGHTEN THE NUT ENSURING COMP.FLANGE SITS ON BRG.WITHOUT ANY PLAY.

61. CHECK THE BEARING END PLAY WITH A DIAL INDICATOR. FIG.79

- PUSH IN COMP.FLANGE WHILE ROTATING SIDE TO SIDE. SET THE DIAL TO ZERO.
- PULLOUT COMP.FLANGE WHILE ROTATING SIDE TO SIDE,READ THE END PLAY ON THE DIAL.
- END PLAY MUST BE 0.002"-0.006"
- IF THE READING IS NOT WITHIN THE LIMITS,
  - ADD SHIMS TO INCREASE THE END PLAY.
  - REMOVE SHIMS TO DECREASE THE END PLAY.

62. AFTER CORRECTING END PLAY,TIGHTEN COMP.FLANGE NUT TO 450 - 600 Lb.Ft.

**Figure78**

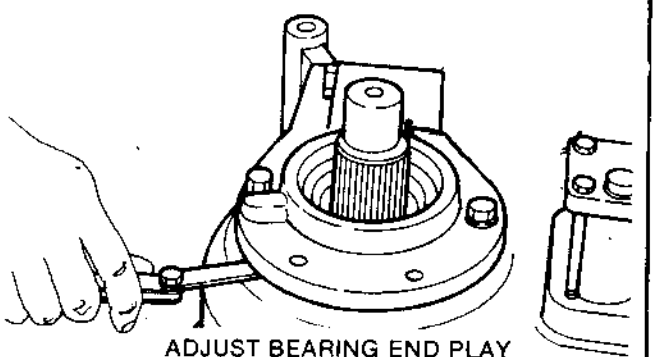
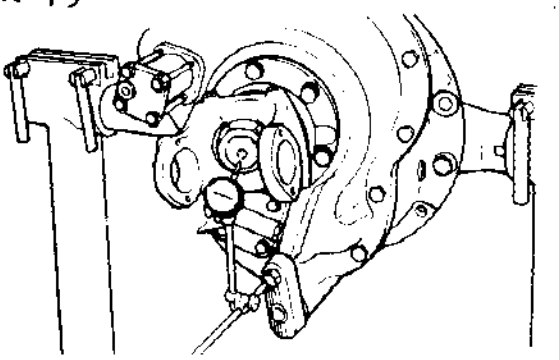



**Figure 79**



63. TO ADJUST THE SHIFT SHAFT, ADOPT FOLLOWING METHOD.

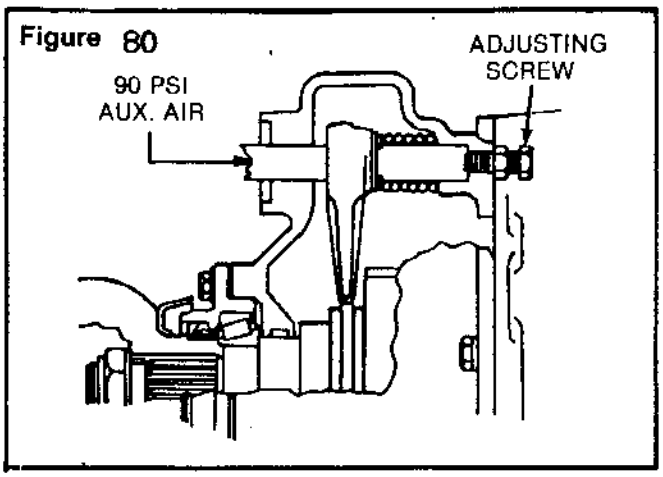
- APPLY 90 PSI AIR PRESSURE TO THE AIR CHAMBER.
- HOLD THE RING GEAR AND ROTATE INPUT SHAFT SUCH THAT(CLUTCH) COLLAR ENGAGES WITH THE LOCKING TEETH.FIG.80
- NOW, TURN THE STOP SCREW TILL IT TOUCHES THE END OF THE SHAFT.
- TIGHTEN THE STOP SCREW ANOTHER 3/4 TURN.
- TIGHTEN THE JAM NUT TO THE TORQUE OF 40 - 55 Lb.Ft.
- DISCONNECT THE AIR SUPPLY.

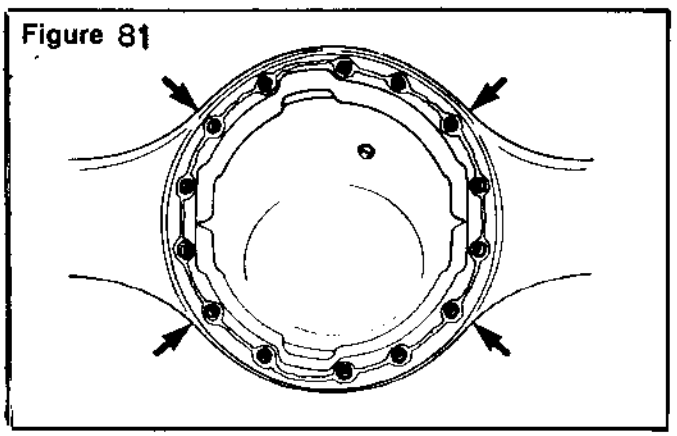
64. CLEAN THE HOUSING MOUNTING FACE. REMOVE THE OLD GASKET MATERIAL.

- APPLY SILICONE GASKET MATERIAL UNIFORMLY.FIG.81

65. INSTALL THE CARRIER INTO THE HOUSING.

- INSTALL WASHERS , NUTS AND CAPSCREWS. TIGHTEN TO THE TORQUE OF 180 - 230 Lb.Ft.




D.OUTPUT SHAFT

66. PRESS INNER AND OUTER BRG.CONES(BACK TO BACK) FROM THE COMP.FLANGE END.

- ENSURE INNER BRG.SITS FIRMLY ON THE SHAFT SHOULDER.

67 PRESS INNER BRG.CUP IN THE BRG.CAGE.

- INSTALL THE OUTPUT SHAFT(NOW FITTED WITH BRG.CONES) THRU THE BRG.CAGE.

68. PUT THE OUTER BRG.CUP OVER THE OUTER BRG.CONE AND INTO THE BRG.CAGE.

69. INSTALL THE SNAP RING.

70. MOUNT THE ASSY IN VISE.

- ATTACH A DIAL INDICATOR TO THE BRG.CAGE FLANGE.FIG.82

- POSITION THE INDICATOR ON THE SHAFT.

71. PULL UP THE SHAFT WHILE TURNING IT SIDE TO SIDE. SET THE INDICATOR TO ZERO.

- PUSH DOWN THE SHAFT WHILE TURNING IT TO SIDE TO SIDE.

- READ THE DIAL

- IF BRG.END PLAY IS MORE THAN 0.003", REPLACE THE SNAP RING

NOTE :

- SNAP RINGS ARE AVAILABLE IN THICKNESS OF 0.155" TO 0.182" IN INCREMENTS OF 0.003".

72. AFTER ADJUSTING END PLAY TO ZERO MEASURE THE BRG.PRE LOAD.

- WIND A SOFT WIRE AROUND SPLINED END OF THE SHAFT.

- ATTACH A POUND SCALE TO THE OTHER END OF WIRE.

- PULL THE SCALE ON A HORIZONTAL LINE AND READ.

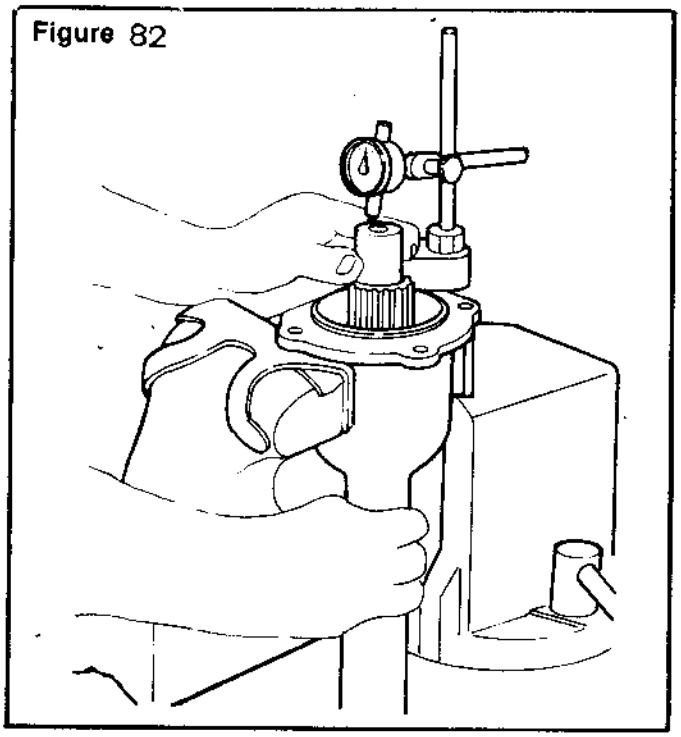
- IF THE ROTATING FORCE IS MORE THAN 12 POUNDS(10 Lb.Ft.),THEN REPLACE THE SNAP RING WITH LESSER THICKNESS.

NOTE :

- A THINNER SNAP RING WILL INCREASE END PLAY AND DECREASE PRE LOAD.

- A THICKER SNAP RING WILL DECREASE END PLAY AND INCREASE PRE LOAD.

Figure 82



73. INSTALL THE THRUST WASHER, COMP.FLANGE,WASHER AND NUT.

- TIGHTEN NUT TO THE TORQUE OF 450 - 600 Lb.Ft.
- RECHECK BRG. PRE LOAD AND END PLAY.

74. REMOVE NUT,COMP.FLANGE AND THRUST WASHER FROM OUTPUT SHAFT.

75. SQUIRT AXLE LUBRICANT FOR INNER AND OUTER BRGS.

- USING A GREASE GUN HAVING FLEXIBLE NOZZLE PACK THE BRG.CAVITIES WITH BRG.GREASE. FIG.83

76. COAT SEAL LIPS WITH AXLE LUBRICANT.

- INSTALL OIL SEAL INTO THE BRG.CAGE. ENSURE SEAL SITS SQUARELY ON THE CAGE SHOULDER. FIG.84

77. INSTALL OUTPUT SHAFT ASSY.WITH THE NEW GASKET.

- ENSURE SEMI CIRCLE CASTING PORTION OF THE CAGE IS AT THE BOTTOM SIDE
- INSTALL WASHERS AND CAPSCREWS AND TIGHTEN TO THE TORQUE OF 35 - 50 Lb.Ft..

78. ASSEMBLE THRUST WASHER, CAMP.FLANGE, WASHER AND NUT.

- TIGHTEN TO THE TORQUE OF 450 TO 600 Lb.Ft..

79. CONNECT UNIVERSAL JOINTS TO THE COMP.FLANGES.

80. INSTALL AXLE SHAFTS WITH THE NEW GASKETS ON TO THE HUBS.

81. INSTALL NUT AND WASHERS TO THE HUB STUDS AND TIGHTEN TO THE SPECIFIED TORQUE.

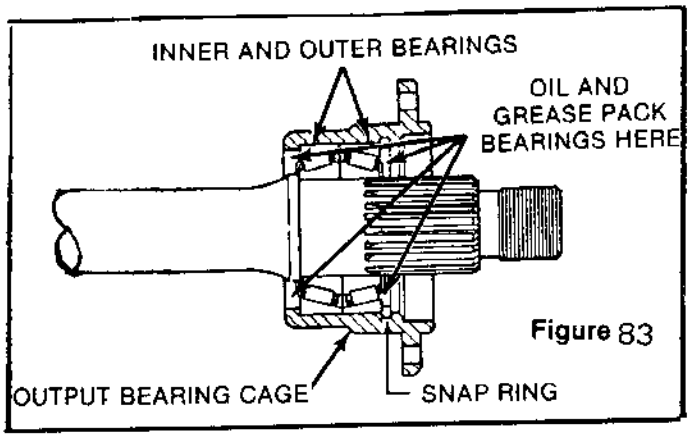


Figure 83

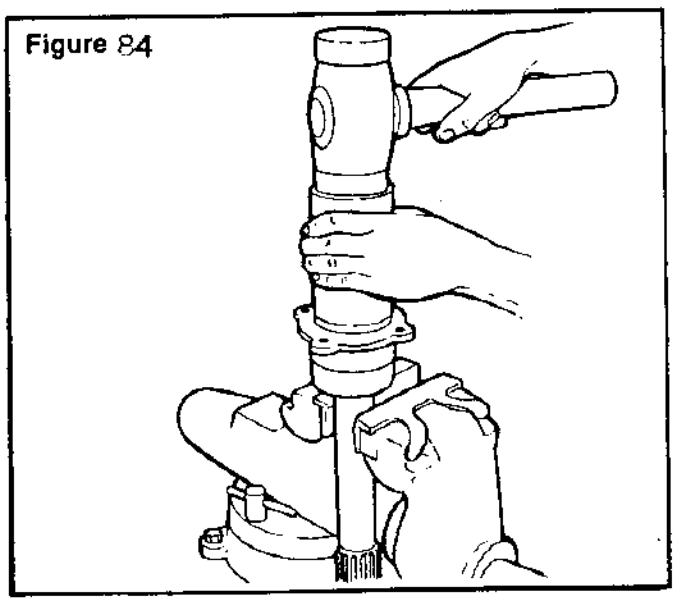


Figure 84

# REAR - REAR AXLE

# REAR-REAR AXLE

- BASICALLY THERE ARE NO MUCH DIFFERENCES BETWEEN THE REAR-REAR CARRIER ASSY. AND THE MAIN DIFFERENTIAL PORTION OF FORWARD-REAR AXLE.

- FOLLOWING ARE THE TWO NOTABLE DIFFERENCES.

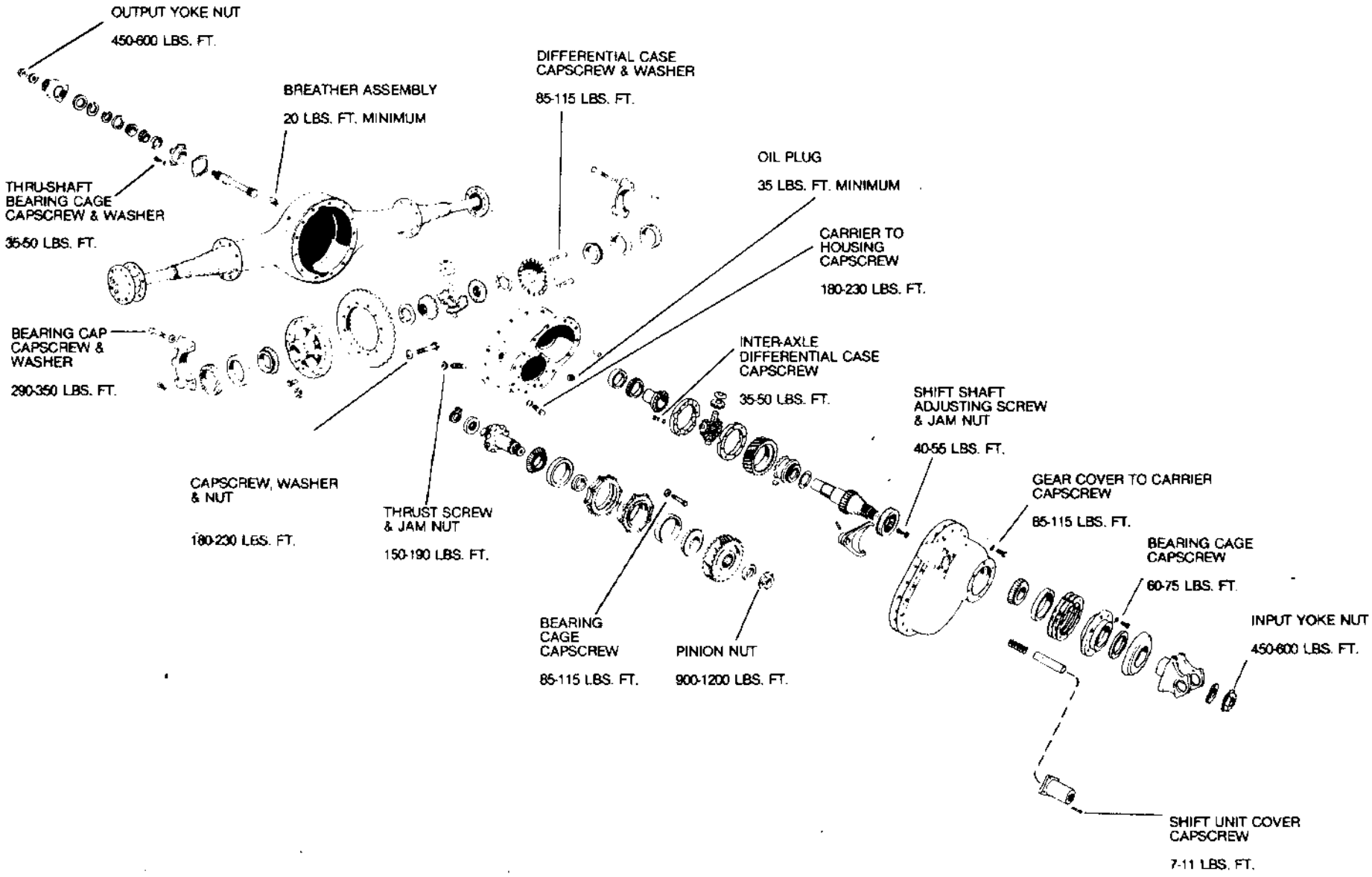
| | FORWARD-REAR | REAR-REAR |
|---|---|---|
| - MOUNTING OVER THE PINION SPLINES | HELICAL GEAR | COMPANION FLANGE |
| - CROWN WHEEL & PINION | R.H SET | L.H SET |

- FOR THE SERVICING OF REAR-REAR CARRIER, FOLLOW THE DISMANTLING, INSPECTION AND ASSEMBLY PROCEDURES OUTLINED FOR THE MAIN DIFFERENTIAL OF FORWARD-REAR AXLE

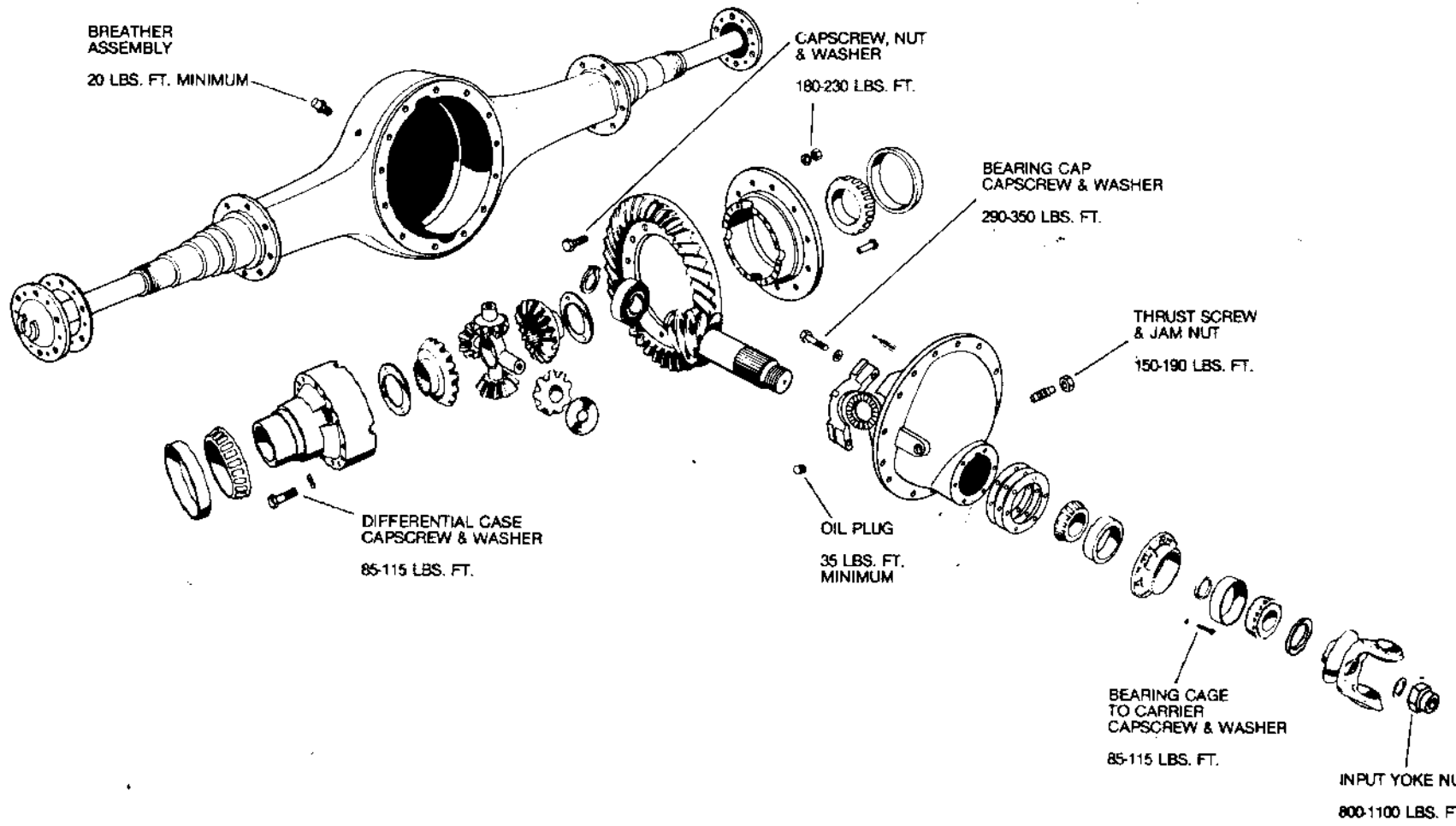
PAGE No. 9 TO 25.

- REFER THE FASTENERS CHART OF PAGE No. 38 FOR TORQUE VALUES.

# FASTENER TORQUE CHART
## FORWARD/REAR AXLE



# FASTENER TORQUE CHART
## REAR/REAR AXLE



## .REPAIR WELDING OF HOUSING:

1. * REPAIR WELD IS PERMITTED ONLY ON THE AREAS OF COVER WELD. SEAM WELD AND BRACKET WELDS.

2. * DRAIN THE LUBRICANT FROM AXLE ASSY.
   REMOVE AXLE SHAFTS AND DIFFERENTIAL CARRIER.

3. * CLEAN THE CRACKED AREA INSIDE AND OUTSIDE THE HOUSING WITH A CLEANING SOLVENT.

   * GRIND THE DAMAGED WELD TO THE BASE METAL.

   * WARM THE COMPLETE HOUSING TO THE TEMPERATURE OF 7Ø °F - 8Ø °F (21 °C TO 27 °C) OR HIGHER

   * HEAT THE DAMAGED AREA TO APPROXIMATELY 3ØØ ° F(149°C).

   * USE A 7Ø,ØØØ psi TENSILE WELD ROD OF 4 TO 5MM DIAMETER. RECOMMANDED ELECTRODES ARE SUPER CITO OF ADVANI OERLIKON AND SUPRATHERM OF D&H

   * OPENING IN COVER WELD MUST BE FILLED TO THE LEVEL WITH OLD WELD.

   * CLEAN THE NEW WELD AREA, REMOVE THE WELD SPATTERS.

   * INSTALL THE DIFFERENTIAL CARRIER AND AXLE SHAFTS.

## TROUBLE SHOOTING AND DIAGNOSIS

| SL. NO. | COMPLAINTS | CAUSE | REASONS |
|---|---|---|---|
| 1 | NO POWER TO REAR-REAR AXLE | SPLINES OF FORWARD SIDE GEAR OR THRU SHAFT SHEARED OFF | LOCKING OF DIFFERENTIAL DURING SPIN-OUT CONDITIONS |
| 2 | SEIZED DIFFERENTIAL PINIONS | EXCESSIVE SPINNING OF WHEELS ON ONE AXLE | o OPERATING VEHICLE WITHOUT LOCKING THE DIFFERENTIAL UNDER POOR TRACTIVE CONDITIONS |
| 3 | DIFF.LOCK IN-OPERATIVE | ----- | o SELECTOR SWITCH NOT WORKING<br>o NO AIR SUPPLY TO SHIFT UNIT<br>o IMPROPER SHIFT FORK ADJUSTMENT<br>o SPLINES OF CLUTCH COLLAR AND SHAFT ARE WORN/CHIPPED<br>o FROZEN SHIFT UNIT DUE TO NON-USAGE. |
| 4 | DIFF.LOCK NOT RELEASING | ----- | o MALFUNCTIONING OF SELECTOR SWITCH<br>o FORK SPRING LOST TENSION/BROKEN |

| SL. NO. | COMPLAINTS | CAUSE | REASONS |
|---|---|---|---|
| 5 | BREAKAGE OF CLUTCH COLLAR OR DIFF.PINIONS | ----- | o SELECTOR SWITCH HAS BEEN OPERATED TO LOCK THE DIFFERENTIAL WHILE VEHICLE WAS IN SPIN-OUT CONDITION |
| 6 | AXLE LUBRICANT TEMPERATURE SHOOTS UP ABOVE 250° F (121°C) | INTER-AXLE CONTINOUSLY IN OPERATION | o DIFFERENTIAL OPERATING IN LOCKED CONDITION EVEN IN GOOD TRACTION ROADS<br>o MISMATCHED TYRES<br>o UNEVEN TYRE PRESSURES<br>o INADEQUATE LUBRICANT LEVEL OR WRONG TYPE OF LUBRICANT<br>o SPINNING OF WHEELS<br>o DURING POOR TRACK CONDITION, DIFF LOCK NOT ENGAGED |

## OPERATIONS AND DRIVING INSTRUCTIONS - DIFF.LOCK

**OPERATING INSTRUCTIONS :-**

- DIFFERENTIAL SHOULD BE LOCKED OR UNLOCKED ONLY WHEN THE VEHICLE IS IN STATIONARY OR MOVING AT A CONSTANT LOW SPEED.

- WHEN DIFFERENTIAL IS LOCKED, THE VEHICLE'S TURNING RADIUS WILL INCREASE. THIS CONDITION IS CALLED "UNDERSTEER". THE DRIVER MUST USE CAUTION WHEN OPERATING VEHICLE WITH LOCKED DIFFERENTIAL.

- IT SHOULD BE ENSURED THAT TYRES OF BOTH TANDEM AXLES NOT VARYING MORE THAN 1/8TH IN RADIUS OR 3/4" IN CIRCUMFERENCE.

- MISMATCHED TYRES OFTEN CAUSE AN INTER-AXLE "FIGHT" AND RESULTS IN HIGH LUBRICANT TEMPERATURE.

- IT IS RECOMMENDED TO MOUNT THE LARGEST TYRES ON ONE SIDE OF AXLES AND THE SMALLER TYRES ON THE OPPOSITE SIDE.(REFER FOOT NOTE)

**DOs' :-**

- LOCK THE DIFFERENTIAL AND OPERATE THE VEHICLE ONLY AT LOW SPEEDS, BELOW 40 KMPH.

- LOCK THE DIFFERENTIAL ONLY WHEN MAXIMUM TRACTION IS NEEDED ON POOR ROAD OR HIGHWAY.

- UNLOCK THE DIFFERENTIAL WHEN TRAVELLING ON GOOD ROAD.

**DO NOTs' :-**

- UNDER NORMAL DRIVING CONDITIONS, THE DIFFERENTIAL LOCK SHOULD NOT BE ACTUATED.

- DO NOT LOCK THE DIFFERENTIAL WHEN WHEELS ARE SLIPPING, AS THIS CAN RESULT IN DAMAGES TO THE DIFFERENTIAL.

- DO NOT LOCK THE DIFFERENTIAL WHEN VEHICLE IS TRAVELLING IN DOWN STEEP GRADIENTS AND TRACTION IS MINIMUM. THIS MAY RESULT IN VEHICLE INSTABILITY.

## LUBRICATION.

**LUBRICANT CAPACITY :** FORWARD -REAR -- 19.0 LITRES (GUIDANCE ONLY)
: REAR – REAR ---------14.0 LTRES (GUIDANCE ONLY)

**LUBRICATION SCHEDULE FOR NEW AND RECONDITIONED UNITS :**

**FIRST LUBRICATION CHANGE** : - MUST BE MADE AT 1600 – 4800 Kms.

**SUBSEQUENT LUBRICANT CHANGE** : MUST BE MADE AT EVERY 40,000 TO 48,000 KMS,WHEN YEARLY MILEAGE IS IN EXCESS OF 96,000 Kms. BUT , IF THE YEARLY MILEAGE IS LESS 96,000 Kms. OIL TO BE CHANGED TWICE A YEAR (AT 6 MONTHLY INTERVALS)

- **THE OIL RECOMMENDED TO USE IS API GL5,SAE 140**
- THERE IS NO UPPER LIMIT ON OUTSIDE TEMPERATURE.
- MAX ALLOWABLE AXLE SUMP TEMPERATURE IS 121 C

**INDIAN EQUIVALENTS OF LUBRICANTS**

| **LUBRICANT MAKE** | **SPECIFICATION** |
|---|---|
| GULF OL INDIA | GULF MP GEAR OIL 140 |
| INDIAN OIL CORPORATION | SERVO GEAR SUPER 140 |
| HINDUSTAN PETROLEUM | HP GEAR OIL XP 140 |
| BHARTH PETROLEUM | SPRIAL HD 140 |
| I.B.P | ESGO 140 |

## DRIVING INSTRUCTIONS :-

### A) TO LOCK THE DIFFERENTIAL :-

- ENSURE NO SLIPPING OF WHEELS. MAINTAINING A CONSTANT SPEED BELOW 40 KMPH. FLIP THE CONTROL SWITCH TO LOCK POSITION.
- LEAVE THE ACCELERATOR MOMENTARILY. ALLOWING THE DIFFERENTIAL TO FULLY ENGAGE.
- RESUME SAFE SPEED.

### B) TO UNLOCK THE DIFFERENTIAL :-

- MAINTAIN A CONSTANT SPEED BELOW 40 KMPH.
- FLIP THE CONTROL SWITCH TO UNLOCK POSITION.
- LEAVE THE ACCELERATOR MOMENTARILY ALLOWING THE DIFFERENTIAL FULLY DISENGAGE.
- RESUME DRIVING AT NORMAL SPEED.

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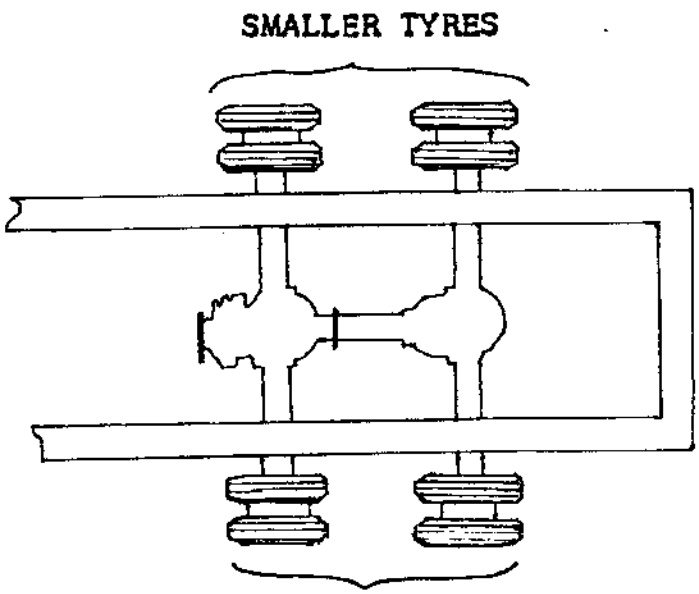
## HINTS ON TYRE - MATCHING

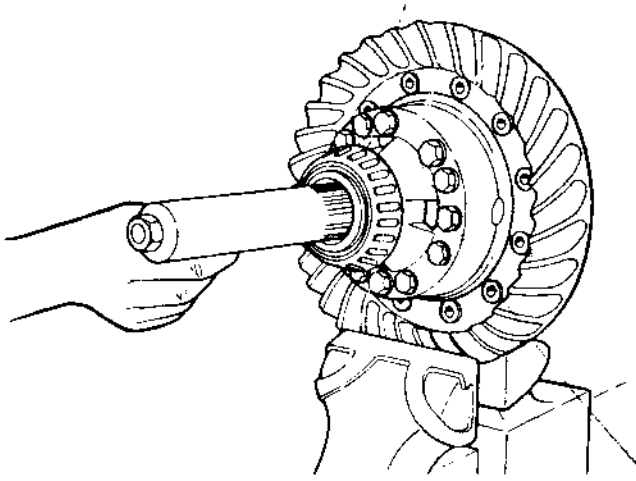



- IT IS RECOMMENDED TO MOUNT THE LARGEST TYRES ON ONE SIDE OF AXLES AND THE SMALLEST TYRES ON THE OPPOSITE SIDE.

## ROLLING RESISTANCE CHECK OF DIFFERENTIAL NEST

A. Place differential and ring gear assembly in a vise.

**IMPORTANT: Use soft metal covers over vise jaws to protect ring gear.**

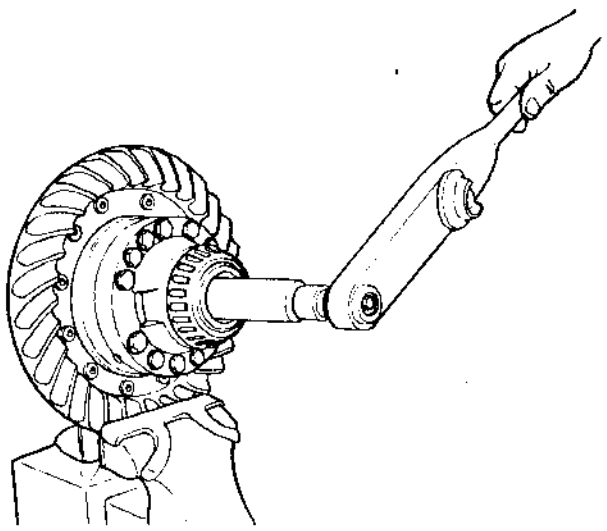


B. Insert checking tool (made from splined axle shaft end) into differential nest. Allow splines of tool to engage with spline of one side gear only.

SIDE VIEW

END VIEW

**NOTE: A suitable checking tool can be made by cutting an axle shaft to an appropriate length and welding a nut on the end to accept a wrench socket.**



C. Using a suitable socket and torque wrench, rotate differential nest while observing scale on torque wrench.

Correct rolling resistance of differential assembly is 50 lb. ft. torque maximum applied to one side gear. This applies to all differential assemblies, including inter-axle differential assemblies.

D. If Dri-Loc fasteners or Rockwell Liquid Adhesive applications are to be used, remove the existing fasteners from the case halves and follow the procedures on page 32.

## TANDEM AXLE TIRE MATCHING

Unmatched tires on Tandem Drive Units will cause tire wear and scuffing and possible damage to the drive units. Consequently, we recommend tires be matched to within ⅛" of the same rolling radius and ¾" of the same rolling circumference.

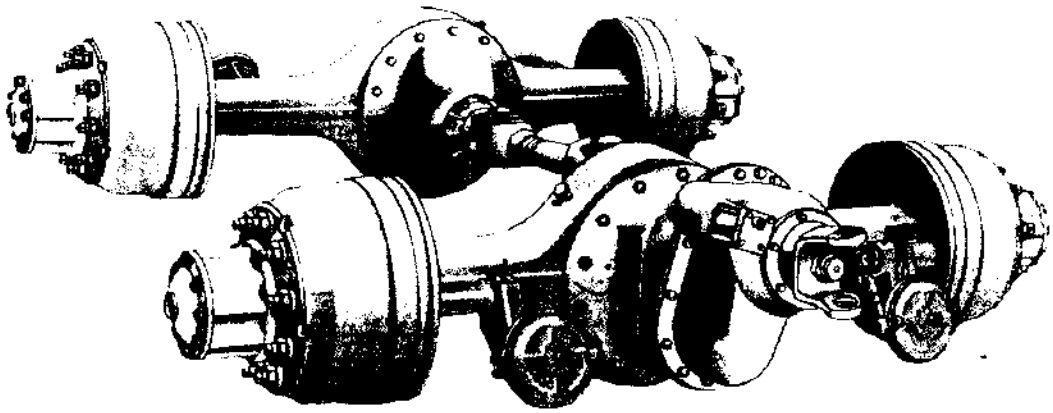
**IMPORTANT: The four largest tires should never be installed on one driving axle or the four smallest tires on the other driving axle. Such tire mounting will cause an inter-axle "fight", unusually high axle lubricant temperatures that result in premature lubricant breakdown, and possible costly axle service.**

**Vary tire air pressure, within the tire manufacturer's recommended range, so the lubricant temperature of both axles is within 30°F. of each other and not in excess of 200°F. This will usually result in uniform tire loading and good tire life.**

SINGLE REDUCTION AXLE

# FIELD MAINTENANCE MANUAL

# SQR-109 TANDEM AXLE



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