ELECTRO-MOTIVE

MAINTENANCE INSTRUCTION

M.I. 3952-1
*Rev. B

TRACTION MOTOR OVERHAUL

Traction motor overhaul instructions are presented in seven sections, each under separate cover, and contain detailed instructions to completely disassemble, inspect, overhaul, assemble, and test the traction motor. Refer to Maintenance Instruction M.I. 3904 for general or "running" maintenance of the traction motor and also for procedures to remove the traction motor from the locomotive truck. These instructions apply to Models D19, D29, D29CC, D29CC-7, D29CCBT, D31, and D36 traction motors unless specifically identified. References to Model D29 motors will include Models D29CC, D29CC-7, D29CCBT, and D31.

SECTION 1
MOTOR DISASSEMBLY

INTRODUCTION

The D19, D29, D29CC, D29CC-7, D29CCBT, D31, and D36 traction motors are similar in appearance and are the same general size, Fig. 1. The construction of the internal parts limits interchangeability of the parts. If different model traction motors are being disassembled, components must be identified so they can be reassembled into the same model traction motor.

CLEANING

Prior to disassembly, the exterior of the traction motor should be thoroughly cleaned to remove all dirt, oil, and grease to prevent dirt from entering the traction motor during disassembly. In cases where dry wiping cloths are incapable of removing caked grease and dirt, a stiff brush or soft wood or fibre scraper may be used. In severe cases it may be necessary to dampen a cloth in solvent such as Stoddards Solvent to loosen and remove imbedded deposits.

CAUTION: Ensure there is adequate ventilation and safety precautions are observed when handling inflammable fluids such as Stoddards Solvent, which has a flash point of 46° C (115° F).

DISASSEMBLY

Perform the following procedure to disassemble the traction motor.

NOTE: When lifting traction motor, use a spreader bar between lifting cables to prevent damage to cables.

*This bulletin is revised and supersedes previous issues of this number.

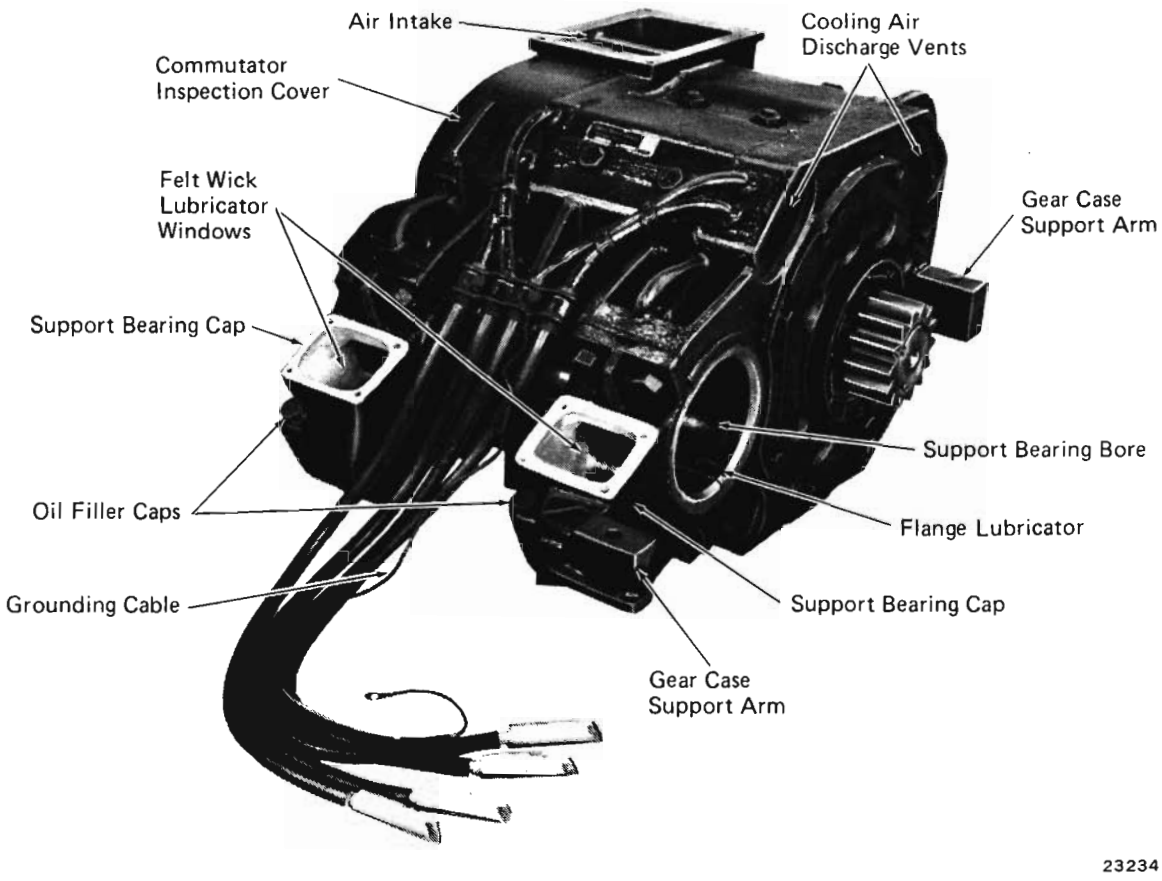

Fig. 1 - Model D29 Traction Motor

1. Place traction motor in its normal position on a suitable stand that will provide a convenient working height.

2. Remove commutator inspection covers, Fig. 1.

3. Raise brush holder springs and pull brushes out of the brush holders. Temporarily place brushes flat on top of brush holders and hold in place with spring. Refer to Service Data for brush lifter tool.

4. Slide a piece of heavy fish paper under the brush holders and around the commutator to protect the commutator from possible damage. Hold fish paper together with a piece of masking tape.

5. Drain oil from axle caps.

PINIONS

The pinion mounted on the traction motor armature shaft is carburized, which provides an extremely hard outer surface yet retains a desired soft core. The number of teeth on the pinion and mating axle gear determine the locomotive gear ratio. Various gear ratios are available to suit specific locomotive service requirements.

PINION REMOVAL

Pinions are heated and shrunk onto the shaft to provide the fit necessary to withstand the strain imposed in operation. The pinion is either removed by pulling off with a hydraulic puller or by "floating-off" by means of hydraulic pressure. Refer to Service Data for special equipment required for pinion removal. The pinion is removed as follows.

PINION REMOVAL WITH HYDRAULIC PULLER

1. Remove the nut from end of armature shaft with a retaining nut wrench and handle, Fig. 2, or with an air impact wrench.

2. Clean threads in pinion and in pulling pilot.

3. Apply spacer between the end of the armature shaft and the ram of the puller to protect the shaft from possible damage.

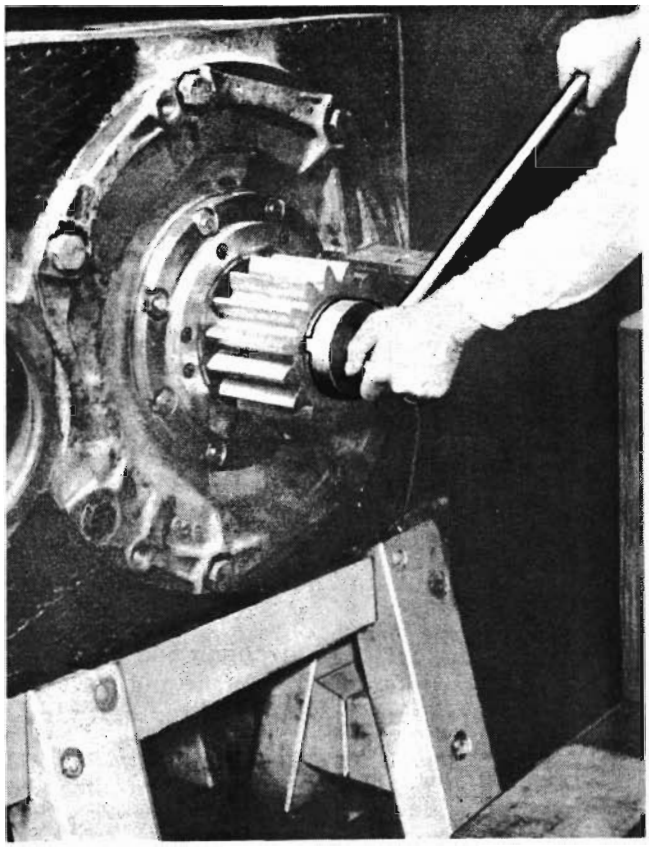

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Fig. 2 – Removing Pinion Retaining Nut

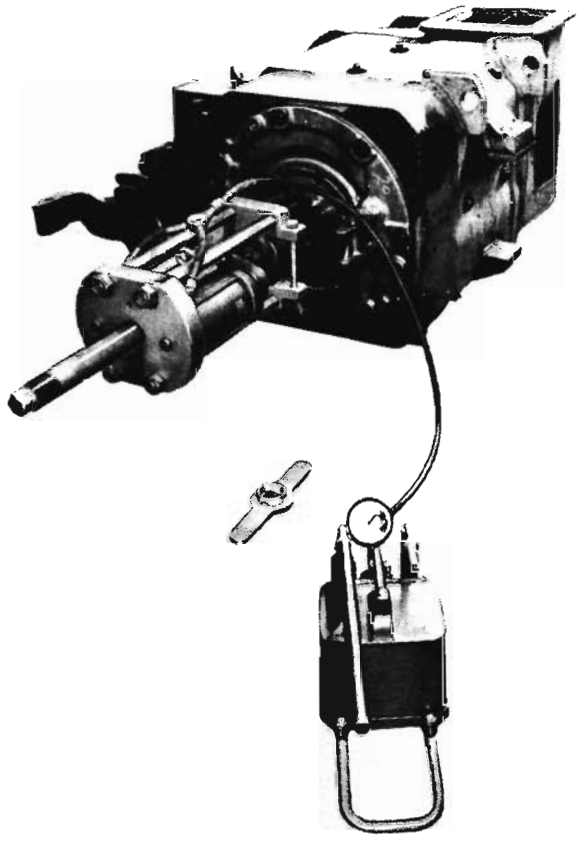

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Fig. 3 – Hydraulic Pinion Puller

4. Install threaded pilot and hydraulic puller assembly, Fig. 3, using a suitable hoist. The threaded pilot should enter the threaded portion of the pinion to its complete depth so threads will not strip.

WARNING: Remove hoist before attempting to pull pinion. Pinion releases suddenly and if left suspended on hoist, can swing violently.

Clear area in line with pinion to avoid damage to equipment or injury to personnel when drive pinion releases.

5. Pump hydraulic puller to build up pressure and remove pinion from shaft.

PINION REMOVAL BY FLOAT-OFF METHOD

The float-off method of pinion removal can be used on armature shafts which are manufactured with a groove around the shaft taper which is connected by drilled passages to a 1/2"-20 tapped hole in the center of the shaft, as shown in Fig. 4. The pinion is removed by applying high pressure oil through the drilled passages to the inside of the pinion bore, which results in the pinion being released from the shaft.

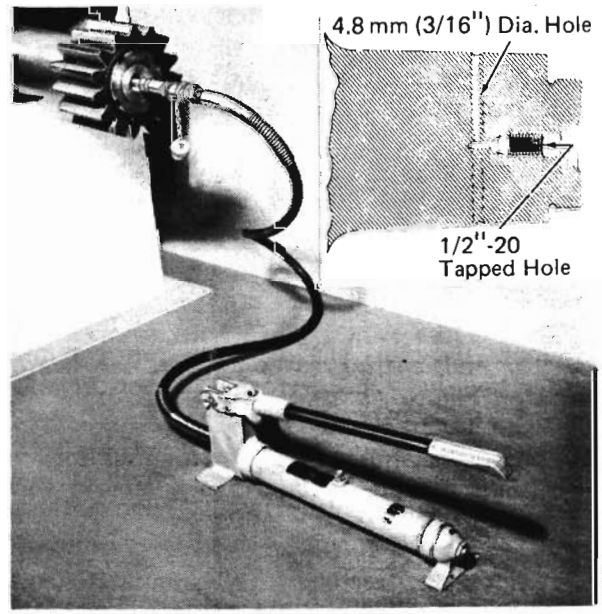

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Fig. 4 – Float-Off Pinion Removal

1. Loosen the nut on the end of the armature shaft with a retaining nut wrench and handle, Fig. 2, or with an air impact wrench approximately one turn, but do not remove.

2. Clean the center of the armature shaft and remove 1/2"-20 socket head setscrew. Ensure the threads and pressure fitting seat are clean.

3. Screw adapter nipple into shaft and tighten to 35-40 N·m (25-30 ft-lbs). Do not overtighten as this will damage the shaft seat.

4. Connect adapter nipple to the hydraulic pump with high pressure hose assembly. Close screw on pump and operate lever to build up pressure. When pressure becomes great enough, pinion will be released from armature shaft and will move off against the retaining nut.

5. Remove equipment and replace setscrew in end of armature shaft.

END HOUSING AND ARMATURE REMOVAL

NOTE: Refer to Service Data for tools and fixtures required to remove end housing and armature.

1. Remove the eight 1-3/8" axle cap bolts from axle caps and remove axle caps from frame.

NOTE: Axle caps must be kept with frame. Frame serial number is stamped on top edge of cap.

2. Remove axle shield.

3. Remove the eight 1/2"-13 bolts from commutator end bearing cover and remove bearing cover, Fig. 5.

4. Loosen the four 7/16"-20 commutator end bearing retainer bolts. Do not remove these bolts at this time.

5. Temporarily replace the commutator end bearing cover and hold in place with four bolts screwed in finger tight. The bearing cover is replaced to hold the bearing in place during subsequent operations.

6. Lift traction motor off the stand and place in a horizontal position on the floor.

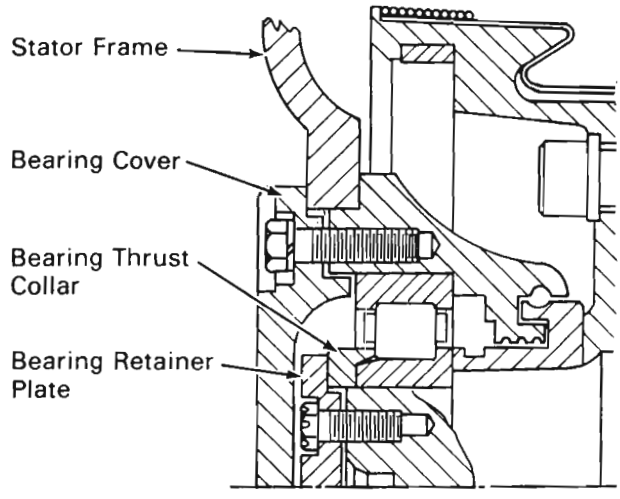

Fig. 5 - Commutator End Bearing Assembly

7. Apply lifting eye bolt to pinion end of shaft. Lift traction motor with a crane and place in a vertical position, commutator end down, on frame stand. Frame stand will support the stator frame in position for removing armature. Leave crane hook attached to armature.

8. Remove the four 1/2"-13 bolts in commutator end bearing cover and remove cover. Remove the four 7/16"-20 bolts in commutator bearing retainer and remove retainer.

9. Remove the eight 7/8"-9 pinion end bearing housing to stator bolts. Raise the crane slightly to apply a strain to the bearing housing.

10. Clean out the 7/8"-9 NC jack bolt holes in the bearing housing with a tap. Insert three 7/8"-9 NC jack bolts.

11. Drive in jack bolts evenly, moving from one bolt to the other. A few turns at a time on each bolt will keep the bearing housing moving straight. Simultaneously jack out the housing and lift the armature with the crane.

12. When the housing is free of the stator, keep the crane hook centered over the assembly and lift the armature out of the stator, Fig. 6. Use care to prevent contact between the armature and the stator frame.

13. While armature is still supported by the crane, assemble commutator end turning fixture to the commutator end armature shaft.

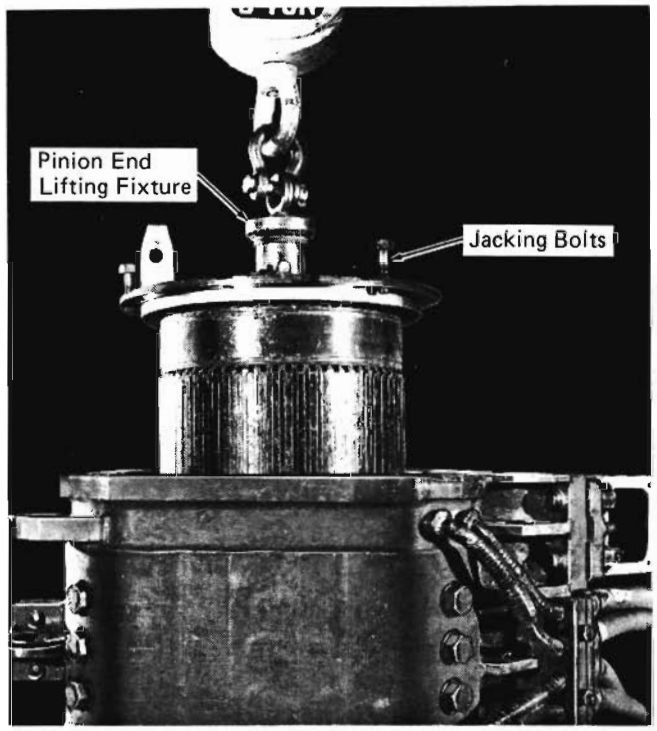

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Fig. 6 – Removing Armature Assembly From Stator

14. Lower the armature. Insert the commutator end turning bar through the eye of the turning fixture. Carefully lower armature to position the turning bar in the pivot stand, Fig. 7. Lower armature into the saddle. Do not set armature on the commutator or bands. Support armature on the core sections only.

15. When the armature is properly positioned in the saddle, remove the crane from the lifting fixture and remove the lifting fixture and turning fixtures from the armature. Remove the three jack bolts from the pinion end bearing housing.

COMMUTATOR END BEARING REMOVAL

When the armature was removed from the stator, the commutator end bearing inner race and inner seal remain on the armature shaft and the bearing housing and bearing outer race remain in the stator, Fig. 8.

Remove the bearing inner race and inner collar as follows:

1. Assemble adapter insert 8213628, retainer ring 8267866, adapter ring 8267867, and pulling clamp 8213627 as shown in Fig. 9.

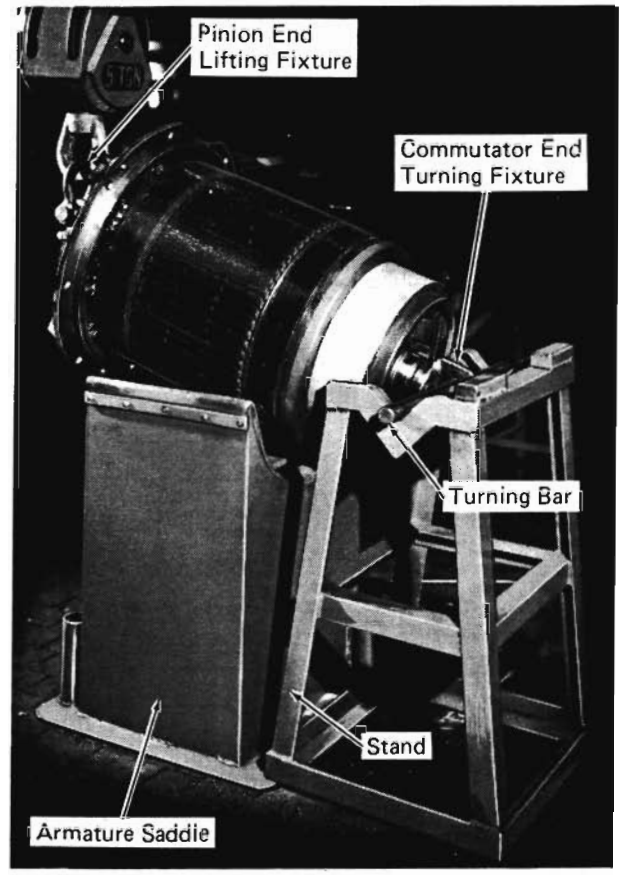

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Fig. 7 – Placing Armature In Saddle

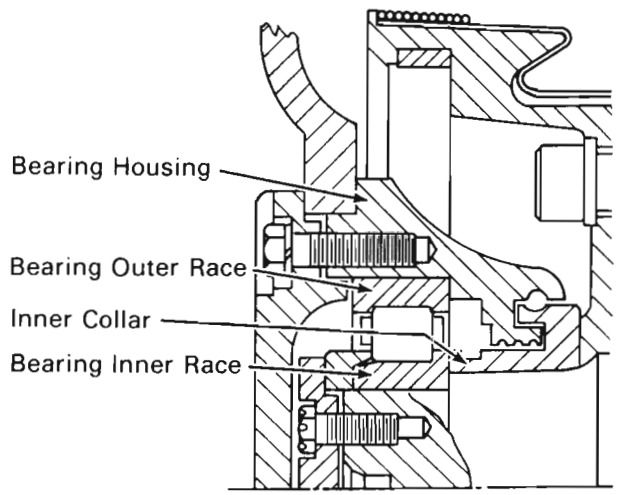

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Fig. 8 – Commutator End Bearing Components

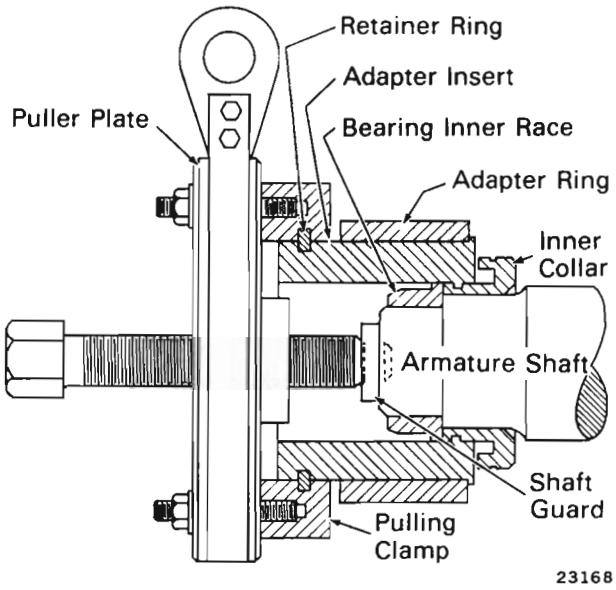

Fig. 9 – Removing Commutator End Bearing Inner Race And Inner Collar

2. Insert four pulling studs into pulling clamp. Support pulling clamp with a crane and slide puller plate onto puller studs. Place nuts on puller stud ends. Insert shaft guard between shaft and puller screw to protect center of shaft.

3. Tighten puller stud nuts. Ensure puller is pulling equally on all four studs. Remove inner bearing race and inner collar and remove pulling equipment.

MODEL D29 OR D36 BEARING HOUSING REMOVAL

1. Place the stator in a horizontal position with the commutator end up.

2. Insert three bearing cover cap screws into holes around the commutator end bearing bore. Screw cap screws into bearing housing just far enough to prevent damaging threads. Tap screw heads lightly with a mallet to force bearing housing out of stator bore. When bearing housing is free of stator bore, support bearing housing by hand. Remove bearing housing from stator and remove three cap screws.

MODEL D19 BEARING HOUSING REMOVAL

1. Remove eight external bolts securing the bearing housing to the stator.

2. Support the bearing housing to prevent it from falling. Insert three jack screws into the three tapped holes provided in the bearing housing.

3. Slowly and evenly tighten jack screws to remove the bearing housing from the stator. Remove bearing housing from stator and remove three jack screws.

BEARING ROLLERS AND OUTER RACE REMOVAL FROM BEARING HOUSING

1. Assemble puller 8273501 as shown in Fig. 10.

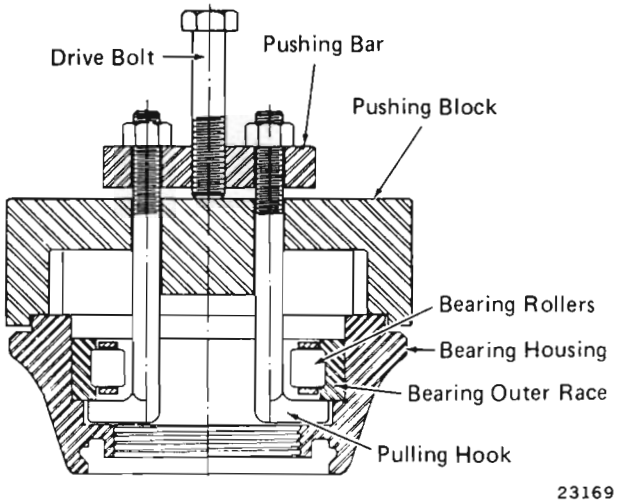

Fig. 10 – Removing Commutator End Bearing Rollers And Bearing Outer Race

2. Tighten puller drive bolt slowly to remove bearing rollers and bearing outer race from bearing housing. If bearings are to be considered for reuse, mark top location of bearing outer race as assembled in bearing housing. Wrap bearing in clean noncorrosive paper.

PINION END BEARING REMOVAL

NOTE: Refer to Service Data for tools or fixtures required to remove pinion end bearing assembly.

1. Insert four puller studs into the holes in the pinion end outer grease seal as shown in Fig. 11.

2. Support puller plate with a crane and slide puller plate onto the puller studs. Place nuts on puller stud ends. Insert shaft guard between shaft and puller screw to protect center of shaft.

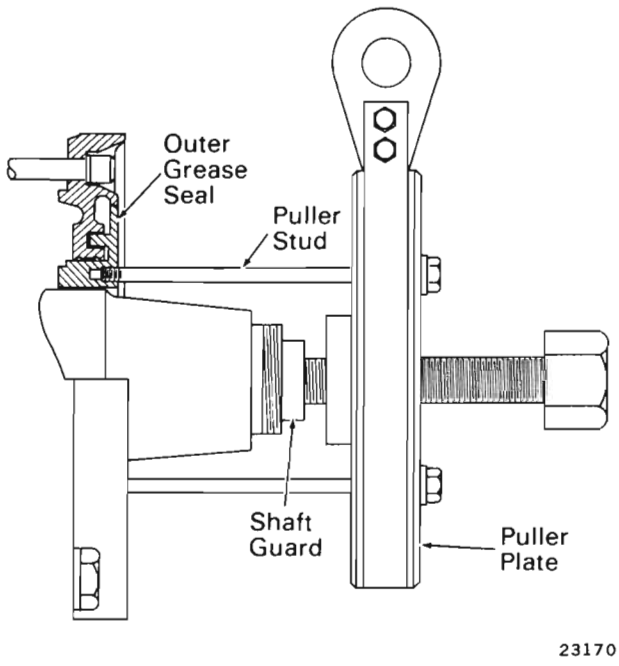

Fig. 11 - Removing Pinion End Outer Grease Seal

3. Tighten nuts on puller studs. Ensure puller is pulling equally on all four studs to prevent damage to bearing parts. Tighten puller plate screw to remove outer grease seal. A power wrench may be used to operate puller plate screw. Remove puller plate and puller studs from seal.

4. Support the bearing housing assembly with a crane and slide the bearing housing with bearing cover, bearing outer race (with rollers), and bearing cap as a complete assembly, off the shaft Fig. 12. Do not cock the assembly as it is being removed from shaft.

5. With the assembly removed from the shaft, remove the eight cap screws holding the bearing cover and bearing cap to the bearing assembly. Remove bearing cover and bearing cap.

NOTE: In Step 6, the bearing outer race (with rollers) must be removed through the bearing cover side of the bearing housing bore. A shoulder in the bearing housing bore prevents the bearing outer race from being removed from the other side of the bore.

6. Remove the bearing outer race from the bearing housing, through the bearing cover side of the bearing housing, by completely supporting the face of the bearing race and pressing the bearing housing off the bearing outer race with a bearing press.

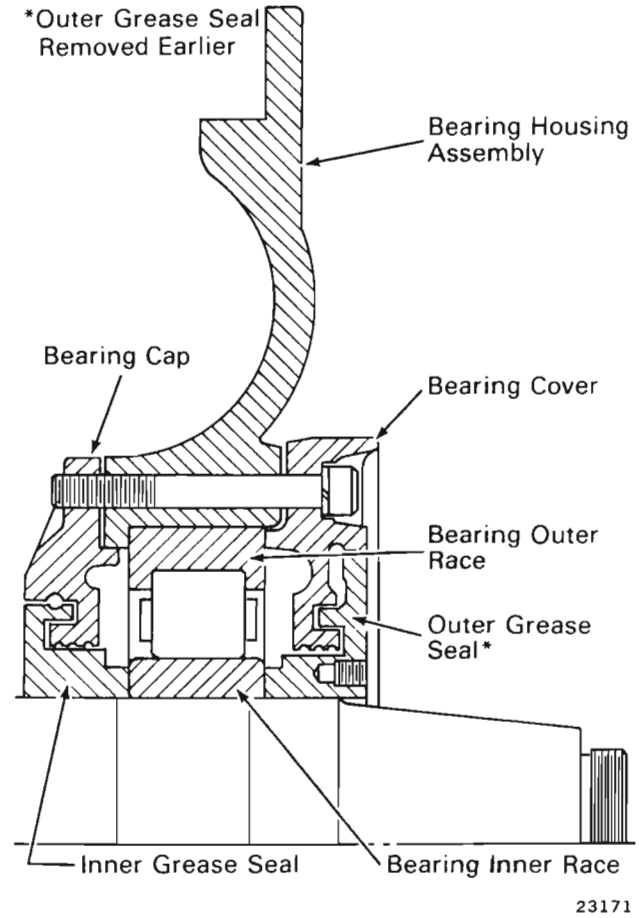

Fig. 12 - Pinion End Bearing Assembly

7. If bearing is to be retained for reuse, mark the outer edge of the race to indicate the top of the bearing as removed from the bearing housing.

8. To remove the pinion end inner race from the armature shaft, assemble adapter insert 8213630 to the bearing inner race and clamp in place with puller clamp 8213627 as shown in Fig. 13.

9. Insert four puller studs into puller clamp. Support puller plate with a crane and slide puller plate onto the puller studs. Place nuts on puller stud ends. Insert shaft guard between shaft and puller screw to protect center of shaft.

10. Tighten nuts on puller studs. Ensure puller is pulling equally on all four studs to prevent damage to bearing inner race. Remove inner race and remove pulling equipment.

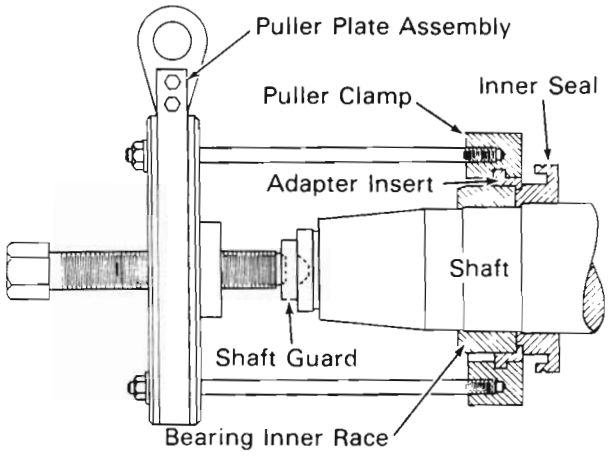

Fig. 13 - Removing Pinion End Bearing Inner Race

11. Check pinion end inner grease seal, Fig. 12. If seal is damaged or worn, the seal should be removed and replaced with a new seal.

12. To remove the inner grease seal, assemble adapter insert 8213635 to the seal and clamp in place with puller clamp 8213632 as shown in Fig. 14.

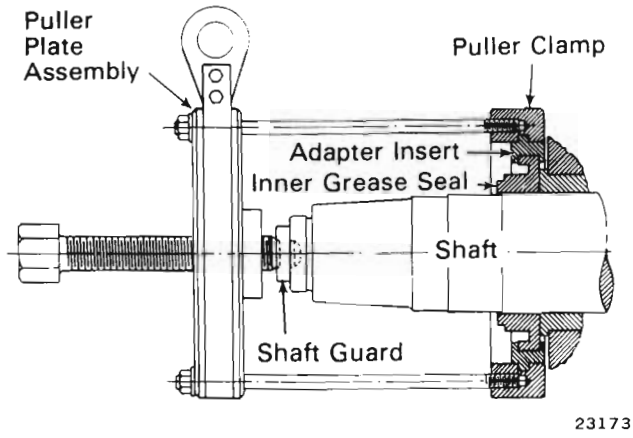

Fig. 14 - Removing Pinion End Inner Grease Seal

13. Insert four puller studs into puller clamp. Support puller plate with a crane and slide puller plate onto the puller studs. Place nuts on puller studs ends. Insert shaft guard between shaft and puller screw to protect center of shaft.

14. Tighten puller stud nuts. Ensure puller is pulling equally on all four studs. Remove inner grease seal and remove pulling equipment.

SERVICE DATA

SPECIFICATIONS

WEIGHTS (Approximate)

	D19, D29, D29CC	D31	D36
Complete Motor	2 087 kg (4600 lbs)	2 087 kg (4600 lbs)	1 814 kg (4000 lbs)
Armature	549 kg (1210 lbs)	549 kg (1210 lbs)	454 kg (1000 lbs)
Gear Case	65 kg (144 lbs)	65 kg (144 lbs)	65 kg (144 lbs)

Resistance at 75° C

	Ohms ± 2%		
Armature	0.0476	0.04096	0.0434
Series Field	0.0272	0.0260	0.0239
Interpole Field	0.0174	0.01713	0.0155

EQUIPMENT LIST

	Part No.
Pinion End Lifting Fixture	8067122
Commutator End Turning Bar	8219763
Hydraulic Pinion Puller Kit	8309742
Hydraulic Pump	8302969
Hydraulic Oil, 3.8 litres (1 gal)	8246430
Hose Assembly	8327054
Nipple, 1/2"-20	8309741
Induction Heater, Pinion	8041446
Brush Spring Lifter	8140869

BEARING REMOVAL TOOLS

NOTE: The pinion end outer and inner grease seal removal tools and the commutator end bearing inner race and inner collar removal tools are a part of Manual Pulling Equipment 8213622.

PINION END OUTER GREASE SEAL

	Part No.
Pulling Studs, 3/8" x 8-1/2" long	8204630
Puller Plate	8313624
Shaft Guard	8204910
Adapter Insert	8213630
Puller Clamp	8213627

PINION END INNER GREASE SEAL

	Part No.
Pulling Studs, 1/2" x 12-1/2" long	8168608
Puller Plate	8313624
Shaft Guard	8204910
Puller Clamp	8213632
Adapter Insert	8213635

COMMUTATOR END BEARING INNER RACE AND INNER COLLAR

	Part No.
Pulling Studs, 1/2" x 3-3/4" long	8267864
Puller Plate	8313624
Shaft Guard	8204910
Adapter Ring	8267867
Adapter Insert	8213628
Puller Clamp	8213627

COMMUTATOR END BEARING ROLLERS AND BEARING OUTER RACE

	Part No.
Puller Assembly	8273501