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This section is for the following models:

H14.00-20.00XM [A214];
H16.00-18.00XM-12EC (H400-450H-EC) [A214];
H16.00-18.00XM/XMS-12 (H400-450HD/HDS) [A236];
H16.00-22.00XM-12EC (H400-500HD/HDS-EC) [B214]

General

This section has the description and repair procedures for the steering axle. For information on the other parts of the steering system, see the section **Steering System** 1600 SRM 671 for A214 trucks and **Steering System** 1600 SRM 1272 for A236 and B214 trucks.

Description

The steering axle assembly includes an axle frame, steering cylinder, tie rods, tie rod pins, and two spindle and hub assemblies. The steering axle is articulated and is connected to the frame with center pivot mounts. The center pivot mounts permit the steering axle to move in the frame mount when the lift truck travels over rough surfaces.

The center pivots for the axle are installed in the frame of the lift truck and rotate in fiber bushings.

The end caps of the steering cylinder are also the mounts for the cylinder and are held to the axle frame by capscrews. Four through bolts hold the end caps to the cylinder shell. The ends of the piston rod extend from both ends of the cylinder. A single piston and the seal are at the center of the piston rod. Oil pressure on one side of the piston moves the piston in the bore. The piston pushes an equal amount of oil from the opposite side of the cylinder. The oil returns to the steering control unit.

When the piston in the steering cylinder reaches the end of the stroke, a relief valve controls the oil pressure. The relief valve for the steering system is in the manifold block that is installed on the steering control unit.

Each spindle turns on two tapered roller bearings in the axle frame. The preload on the bearings is controlled by shims at the lower bearing cap. Tie rods connect the spindle arms to the cylinder. Grease seals protect the spindle bearings from dirt and water. Wear sleeves prevent the seals from causing wear on the spindle.

The wheel hubs rotate on two tapered roller bearings. The grease seal and O-ring protect the bearings from dirt and water. Wear sleeves prevent the seal from causing wear on the spindles.

Steering Axle Repair

REMOVE

WARNING

Put the lift truck on blocks. Follow the procedures for raising the lift truck described in the Operating Manual for this lift truck. The surface must be solid, even, and level. Make sure the blocks are solid one-piece units. Make sure the lifting devices used during repairs can lift the weight of the parts.

The steering axle can be removed without removing the counterweight. See Figure 1.

1. Make sure the wheels are set for straight travel. Put blocks under the frame in front of the steer wheels, so that the steering axle can be removed. The top of the axle frame must have clearance under the counterweight so that the steering axle can be removed.
2. It is not required, but it can make removal of the axle easier if the wheels are removed. Disconnect the hydraulic lines at the steering cylinder. Install caps on the cylinder and put plugs in the hydraulic lines. The caps will prevent the spindles from turning when the axle is removed from under the lift truck.
3. Slide a floor jack or the forks of another lift truck under the steering axle. Raise the lifting device until it holds the weight of the axle assembly. Remove the four capscrews and washers that fasten the two bearing caps to the frame. Remove the bearing caps and slowly lower the axle assembly. Carefully remove the axle assembly from under the lift truck.

INSTALL

1. Install the thrust washer, shims, and seal ring on each pivot shaft. See Figure 1. Make sure each seal ring fits in the groove in the steering axle. Lubricate the pivot shafts with multipurpose grease and install the bushings.

2. Use a floor jack or another lift truck to put the steering axle into the position in the frame. Make sure the pivot bushings fit in the mounts in the frame of the lift truck.

3. Install the bearing caps. Tighten the capscrews and check that there is zero clearance between the shims and the frame of the lift truck. Add or remove shims as necessary to get zero clearance. After adjustments tighten the capscrews to 580 N•m (430 lbf ft). Use a tool to move the seal rings from the groove in the steering axle.

NOTE: Tighten the capscrews for the bearing caps again after eight hours of service.

4. Remove the plugs and caps and connect the hydraulic lines to the steering cylinder. Install the wheels if they were removed.

5. Operate the steering system to remove the air from the system. Turn the steering wheel several times from one stop to the other stop. Check for hydraulic leaks.

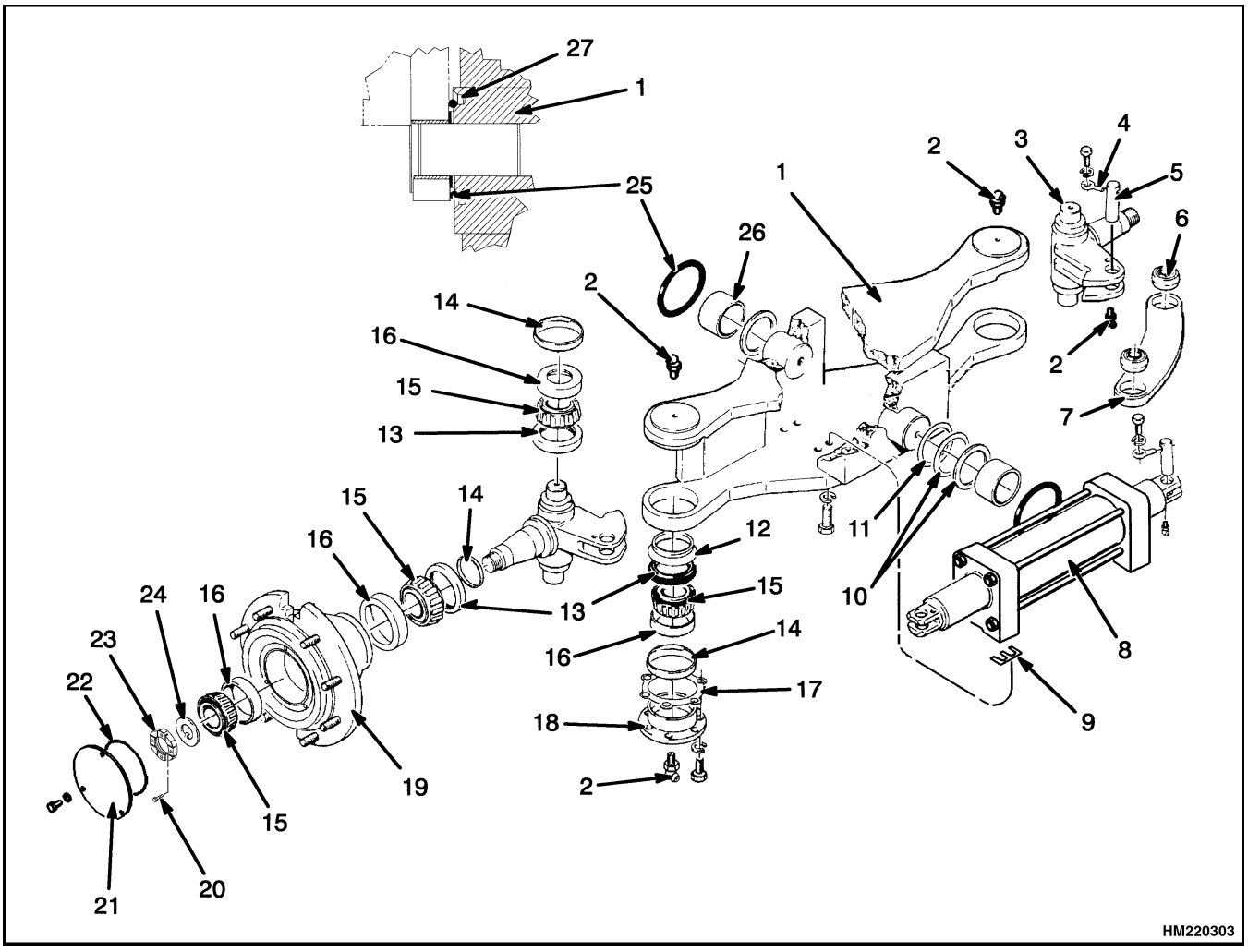


Figure 1. Steering Axle

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

Legend for Figure 1

1. AXLE FRAME
2. GREASE FITTING
3. SPINDLE
4. ANCHOR PIN
5. PIN
6. BEARING AND SEAL
7. TIE ROD
8. STEERING CYLINDER
9. SHIM
10. SHIMS
11. THRUST WASHER
12. DUST SEAL
13. GREASE SEAL
14. WEAR RING
15. BEARING CONE
16. BEARING CUP
17. SHIM
18. BEARING CAP
19. HUB
20. CAPSCREW
21. HUB COVER
22. O-RING
23. SPINDLE NUT
24. TONGUED WASHER
25. SEAL RING
26. FIBER BUSHING
27. GROOVE

Wheels and Hubs Repair

REMOVE AND DISASSEMBLE

WARNING

Completely remove the air from the tire before removing the tire and wheel from lift truck. Air pressure in the tires can cause the tire and wheel parts to explode causing serious injury or death.

1. Raise the axle to remove the weight from the tires, but have the tires still touching the floor. Loosen the wheel nuts just enough so that they can be easily removed. Raise the axle so that the tires can be removed. Use a tire jack to remove the tires and wheels. See Figure 1.

2. If a tire jack is not available, raise the axle only enough so the tires are just touching the floor. Slide the tires from the axle while they are still on the floor. It is helpful to put a lubricant on the floor (oil, grease, or liquid soap).

3. Remove the hub cover and O-ring. Release the four capscrews of the spindle nut and remove the spindle nut and tongued washer. Remove the bearing cone. Slide the hub from the spindle. Remove the seal and the inner bearing cone.

4. If the wheel bearings must be replaced, use a brass drift to remove the bearing cups.

5. Remove the wear sleeve from the spindle.

6. Repeat the procedure for the other hub.

CLEAN

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

Clean all parts with solvent. Make sure the bearings are clean and dry.

ASSEMBLE AND INSTALL

1. If the bearings in the hubs must be replaced, use a press to install the new bearing cups in the hub. See Figure 1. Lubricate and install the inner bearing cone in the hub. Install a new seal in the hub.

2. Install the wear sleeve on the spindle. Lubricate the bearing cones and seal surfaces with grease.

CAUTION

Do not damage the seals during installation.

3. Carefully slide the hub onto the spindle. It can be necessary to use a lifting device during installation. Lubricate and install the outer bearing cone.

4. Install the tongued washer. Install the spindle nut. Tighten the spindle nut to 190 to 210 N•m (140 to 155 lbf ft) while rotating the hub in both directions to seat the bearings. Verify the wear ring is against the shoulder of the spindle and that the inner bearing cone is fully seated against the wear ring. Loosen the spindle nut, then tighten again to 5 to 10 N•m (3.7 to 7.4 lbf ft).

5. Apply more torque to eliminate end play. Tighten spindle nut from this position 57 to 73° more. Torque capscrews on the spindle nut evenly to 32 to 36 N•m (23.7 to 26.6 lbf ft).

6. Install O-ring and hub cover.

WARNING

Add air to the tires only in a safety cage. Inspect safety cage for damage before use. When adding air, use a clip on chuck with enough hose to let the operator stand clear of the cage.

7. Install the wheel on the hub. Be careful not to damage the threads on the studs. Tighten the wheel nuts to 640 to 680 N•m (470 to 500 lbf ft).

WARNING

When the wheels have been installed, check all wheel nuts after 2-5 hours of operation. Tighten the nuts to the correct torque. When the nuts stay tight after an 8-hour check, the interval for checking can be extended to time specified in the Periodic Maintenance section.

8. Repeat the procedure for the other wheel.

Spindles and Bearings Repair

REMOVE

1. Remove the capscrew, anchor pin, and tie rod pin from each end of the tie rod. Remove the tie rod. See Figure 1.
2. Remove the capscrews from the bearing cap. Remove the bearing cap and shims. If necessary, remove the bearing cup from the bearing cap. See Figure 2.
3. Tilt the spindle and lift the spindle from the axle. If the bearing must be replaced, remove the bearing and seals from the spindle. If the wear sleeve and the bearing cup must be replaced, remove them from the axle frame.
4. Repeat the procedure for the other spindle.

CLEAN

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

Clean all parts except the tie rod bearings in solvent. Make sure all bearings are clean and dry.

ASSEMBLE AND INSTALL

1. If necessary, install the wear sleeves in the bearing cap and axle frame. Install new seals on the spindle. Lubricate the seals with grease.
2. Lubricate the bearings cones with wheel bearing grease. If necessary, press the new bearing cups into the steering axle frame and bearing cap.
3. Install the spindle in the steering axle and make the following bearing adjustment:
   a. Install the bearing cap without the shims. Tighten the capscrews to 30 N•m (20 lbf ft) while rotating the spindle.
   b. Loosen the capscrews and tighten again until there is no clearance in the spindle. Measure the gap for the shims and install a shim pack equal to the gap. There must be zero clearance for the bearings. Tighten the capscrews to 66 N•m (50 lbf ft).
4. Lubricate the bearings in the tie rods. Install the seals on the tie rod bearings. Use an alignment pin to align the seals with the bushings.
5. Lubricate the tie rod pin with antiseize compound and install the tie rod pins, anchor pins and capscrews. Make sure the grease fittings on the tie rod pins are on the bottom and toward the rear of the lift truck. Tighten the capscrews for the anchor pins to 25 N•m (18 lbf ft).
6. Repeat the procedure for the other spindle.

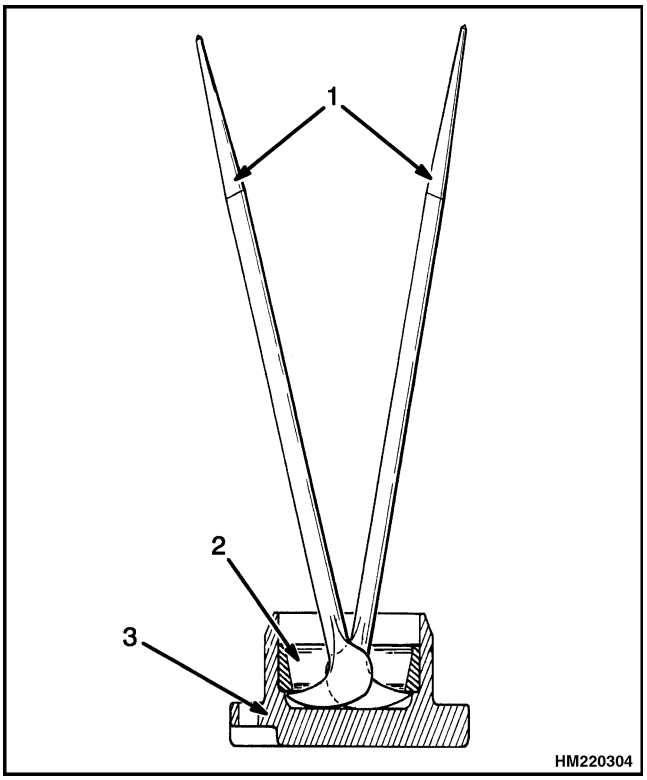


Figure 2. Bearing Cup Removal

Legend for Figure 2

1. PRY BAR
2. BEARING CUP
3. BEARING CAP

Steering Cylinder Repair

REMOVE AND DISASSEMBLE

1. Disconnect the hydraulic lines at the steering cylinder. Install caps in the fittings on the cylinder and put fittings on the hydraulic lines. See Figure 3.

2. Disconnect the tie rods as described in the procedures for the Spindles and Bearings Repair, Remove, in this section.

3. Remove the capscrews and washers that fasten the cylinder to the axle frame. Remove the steering cylinder from the axle.

4. Remove the nuts from the through bolts. Hold the end of the steering cylinder over a drain pan. Remove the end cap from the shell. Oil will drain from the cylinder. Repeat the procedure for the other end.

5. Carefully slide one end cap from the rod. Carefully pull the rod from the shell. Remove the other end cap from the shell. Remove all seals, wipers, and O-rings.

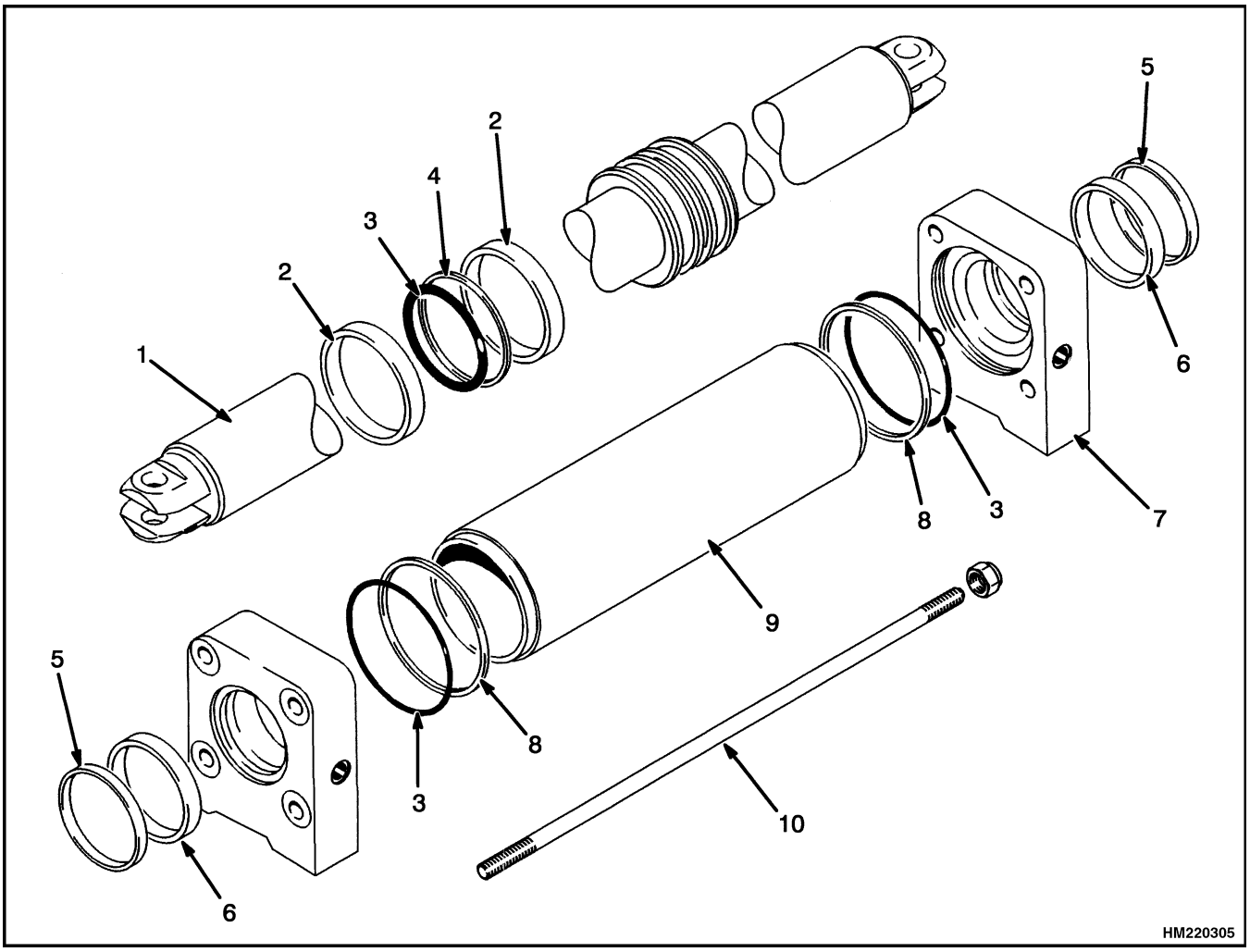
CLEAN AND INSPECT

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

1. Clean all parts in solvent. Use compressed air to dry the parts.

2. Inspect the piston rod for grooves or damage. Remove small scratches with fine emery cloth. Inspect the cylinder bore for damage. Inspect the mounts for cracks.



1. ROD AND PISTON
2. WEAR RING
3. O-RING
4. PISTON SEAL
5. WIPER
6. ROD SEAL
7. END CAP
8. BACKUP RING
9. SHELL
10. THROUGH BOLT

Figure 3. Steering Cylinder

ASSEMBLE AND INSTALL

1. Put the O-rings, seals, and wipers in warm hydraulic oil.

CAUTION

Do not damage the O-rings, seals, or wipers during installation.

2. Install the wipers and rod seals in the end caps. Install the O-ring and backup ring in each end cap. See Figure 4 and Figure 3.

3. Install the O-ring and piston seal on the piston. Install the wear rings on the piston.

4. Install one end cap on the rod.

5. Carefully slide the rod into the shell. Keep the rod in the center of the shell during installation. Carefully slide the end cap onto the shell. Install the other end cap on the rod and shell.

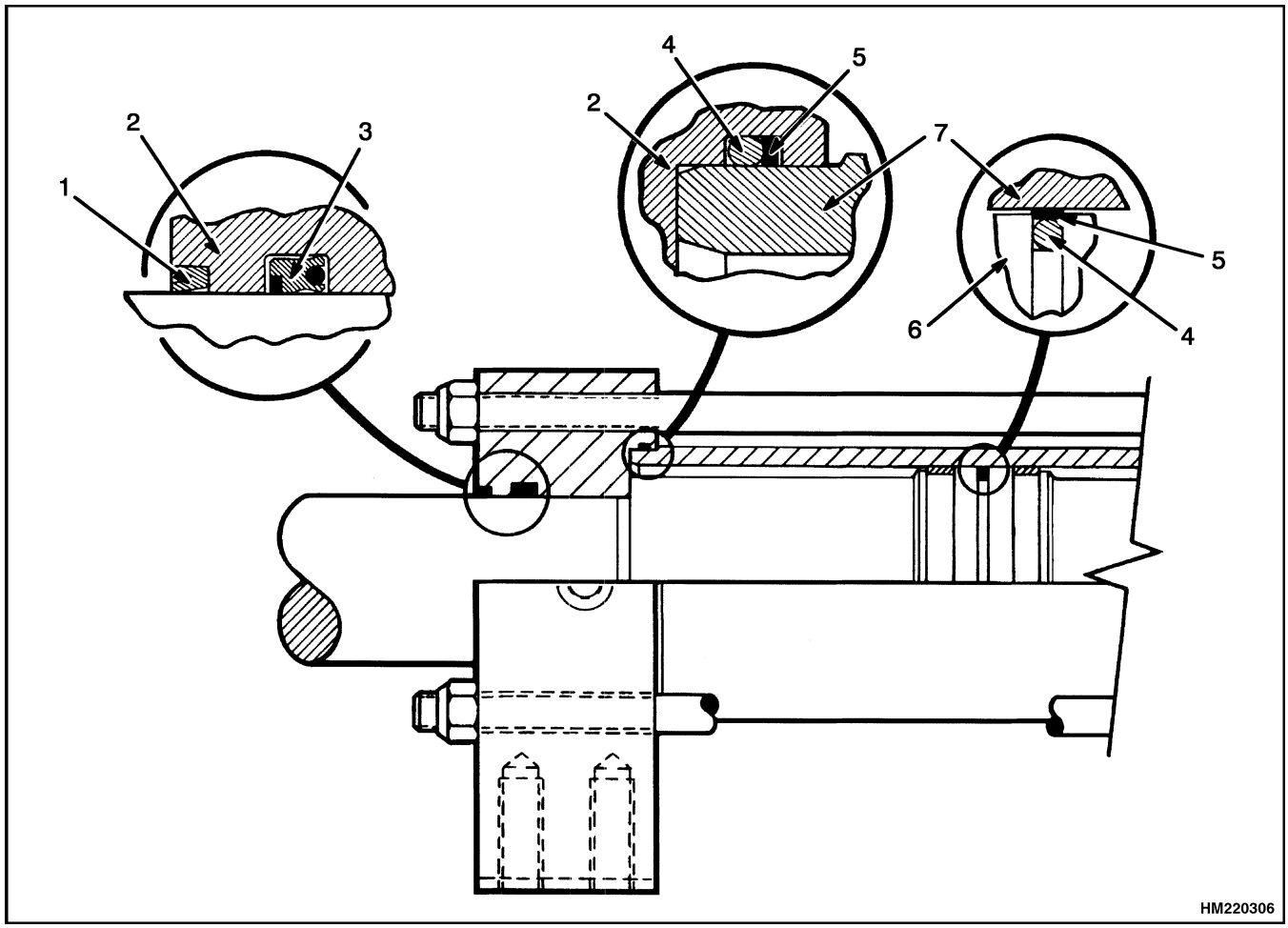
6. Install the through bolts and nuts to hold the end caps in position. Tighten the nuts to 300 to 320 N•m (225 to 235 lbf ft).

7. Loosen the nuts at one end of the through bolts one complete turn. Install the cylinder on the axle frame and install the capscrews and washers, but do not tighten them. Measure the clearance between one of the end caps and the axle frame. Install shims to fill the gap. Tighten the cylinder mounting capscrews by hand.

8. Tighten the nuts on the through bolts to 300 to 320 N•m (225 to 235 lbf ft). Tighten the cylinder mounting capscrews to 820 N•m (605 lbf ft).

9. Install the tie rods as described in the procedures for the Spindles and Bearings Repair, Assemble and Install, in this section.

10. Remove the plugs and caps and connect the hydraulic lines to the steering cylinder. Start the engine and operate the steering system to remove the air from the cylinders and the system. Turn the steering wheel several times from one stop to the other.



1. WIPER
2. END CAP
3. ROD SEAL
4. O-RING
5. BACKUP RING
6. PISTON
7. SHELL

Figure 4. Steering Cylinder Seals

Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The steer wheels do not move when the steering wheel is turned.	The oil level is low or there is no oil in the tank.	Fill tank. Check for leaks.
	The steering control unit is damaged.	Repair or install new control unit.
	No oil flow from the steering control unit to the steering cylinder.	Repair or install new components. Check for leaks.
Slow or difficult steering.	Relief valve for the steering system needs adjustment.	Adjust or install new relief valve.
	Low oil pressure from the hydraulic pump.	Check for restrictions. For A214 trucks, see the Troubleshooting Charts in **Hydraulic System** 1900 SRM 666 and for A236 and B214 trucks, see the Troubleshooting Charts in **Hydraulic System** 1900 SRM 1275.
	Seal in the steering cylinder has a leak.	Install new seal.
	Steering control unit is worn or has damage.	Repair or install new control unit.
Steering wheel turns the tires in the wrong direction.	The hydraulic lines are not connected correctly at the steering cylinder or at the steering control unit.	Connect lines properly.
Steering function continues after the steering wheel stops.	The steering control unit was assembled wrong or has damage.	Repair or install new control unit.
There is air in the steering system.	The oil level in the tank is low.	Add hydraulic oil as necessary. Check for leaks.
	Air was not removed after repair to the hydraulic or steering system.	Remove air from system.
	The hydraulic pump has an air leak at the inlet.	Repair system. Remove air from system.