

STEERING GEAR ASSEMBLY

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DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION OF STEERING GEAR ASSEMBLY

The Opel 1900 • Manta and GT steering gear is the rack and pinion type. The steering gear pinion shaft, connected to the lower end of the steering column, moves the rack to the left or right thereby transmitting the turning motion of the steering wheel to the tie rods and steering arms.

The steering gear housing is held to the cross member by rubber bushings and clamps. The bushings serve to prevent driving noises and vibrations from being transmitted into the passenger compartment. A pinion shaft is seated in the upper portion of the steering gear housing and is supported by a needle bearing in the upper housing, and a bushing in the lower housing. The pinion is not adjustable.

A rubber "O" ring seal is provided for sealing needle bearing, and a second "O" ring for sealing pinion bushing. The rack and pinion shaft are held in mesh by a thrust spring and shell. See Figure 3D-2.

The pressure of the thrust spring may be varied by means of an adjusting screw. The spring forces the sintered bronze shell against the rack, which in turn is held against the pinion shaft. Backlash in the steer-

ing gear is avoided, and road shocks are effectively absorbed.

The rack is seated in the long neck of the steering gear housing in a self-lubricating sintered metal bushing. It is laterally guided by the sintered bronze shell in the adjusting screw opening, and in the short gear housing neck by the rack guide bushing. See Figure 3D-3.

MAINTENANCE AND ADJUSTMENTS

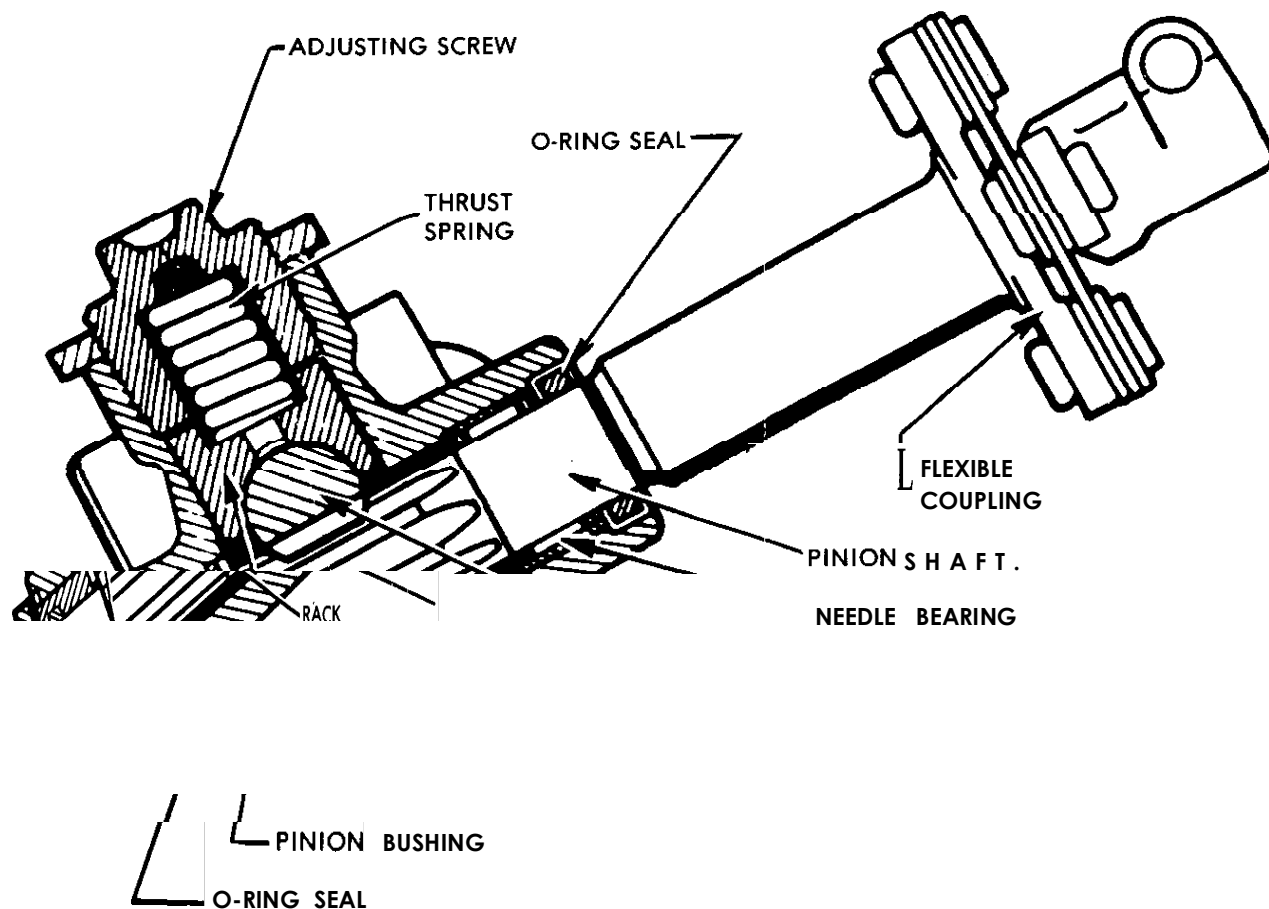
ADJUSTMENTS OF STEERING GEAR

Adjustment of Steering Gear

Adjustment of the steering gear assembly is accomplished by turning the adjusting screw in or out. See Figure 3D-2.

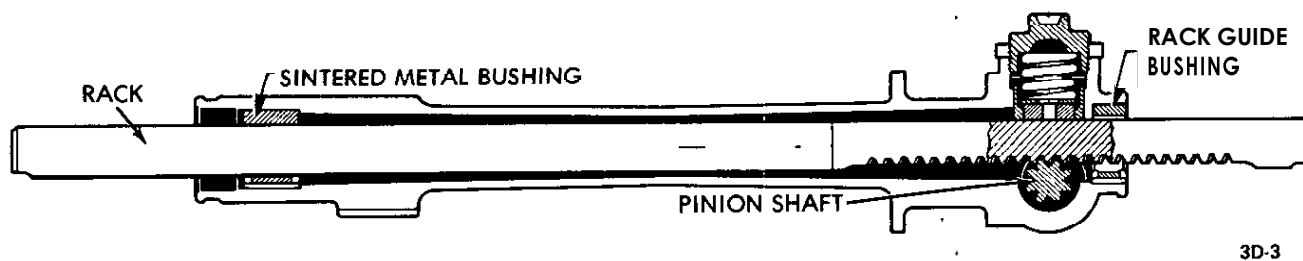
Positioning of the adjusting screw exerts a pressure on the rack, thereby varying the backlash between the pinion and rack.

1. Set steering gear to high point by positioning front wheels straight ahead with steering wheel centered. Flexible coupling bolt hole will be positioned horizontal (or parallel) to the rack.
2. Thread adjusting screw into steering gear housing



3D-2

Figure 3D-2 Steering Gear Assembly - End View



3D-3

Figure 3D-3 Steering Gear Assembly Front View

until a resistance is felt. By threading in adjusting screw when steering gear is set to highpoint, the sintered bronze shell is pushed against the rack so that the rack is blocked.

3. Back off adjusting screw $1/8$ to $1/4$ of a turn.
4. Tighten lock nut to a torque of 43 lbs.ft.
5. Fill area under pinion shaft rubber boot with steering gear lubricant and slide boot into position.

MAJOR REPAIR

REMOVAL AND INSTALLATION OF STEERING GEAR ASSEMBLY AND TIE RODS

Removal. GT

1. Remove rubber knee protector pad.

2. Loosen clamp securing flexible coupling to steering shaft.

4. Remove stop bolt (see Figure 3D-4) from underside of steering column (secures steering shaft bushing to mast jacket), and pull steering wheel rearward approximately three inches.

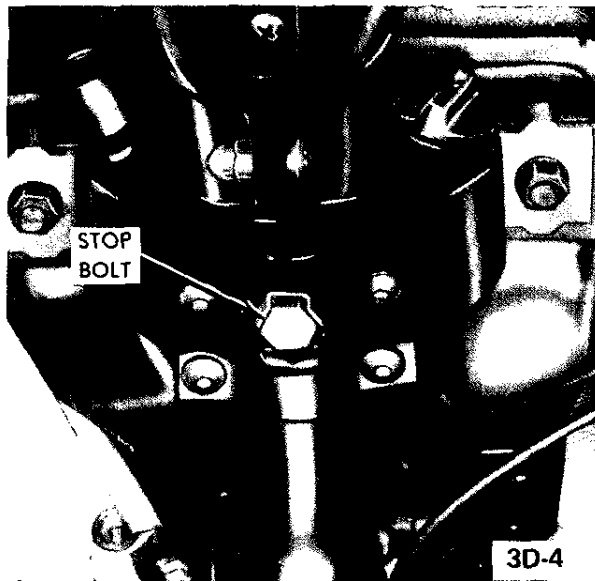


Figure 3D-4 Stop Bolt

4. Remove cotter pin located on left and right tie rod ends and unscrew nut.

5. Using remover J-21687, press ball studs out of steering arms (see Figure 3D-5).

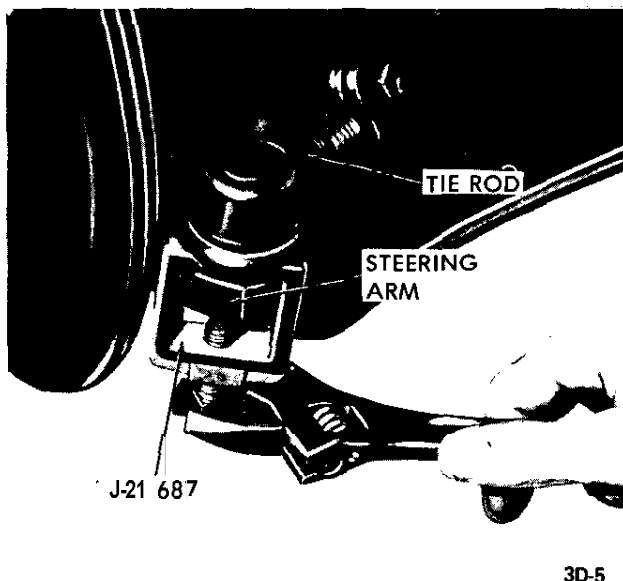


Figure 3D-5 Removing Ball Stud

6. Remove four attaching bolts securing steering gear to front suspension cross member (see Figure 3D-6) and lift off steering gear assembly and tie rods.

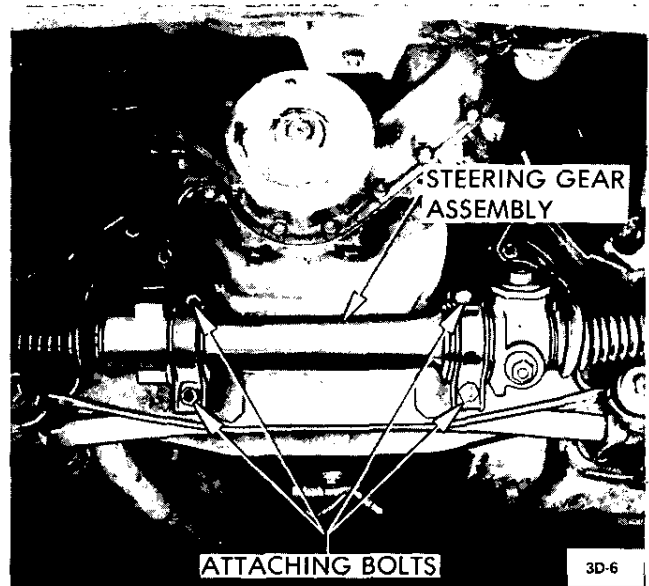


Figure 3D-6 Steering Gear Assembly Attaching Bolts

Removal (Opel 1900 - Manta)

1. Remove splash shield from lower deflector panel and both side members. See Figure 3D-7.

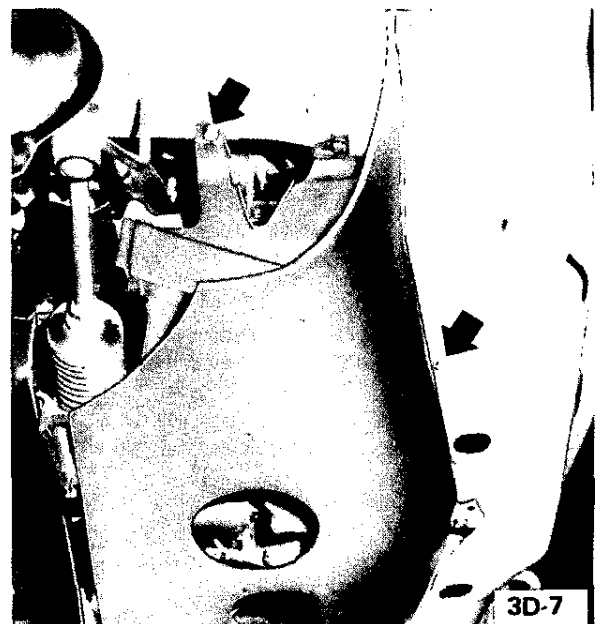


Figure 3D-7 Removing Splash Shield

2. Remove clamp bolt securing flexible coupling to steering shaft. See Figure 3D-8.

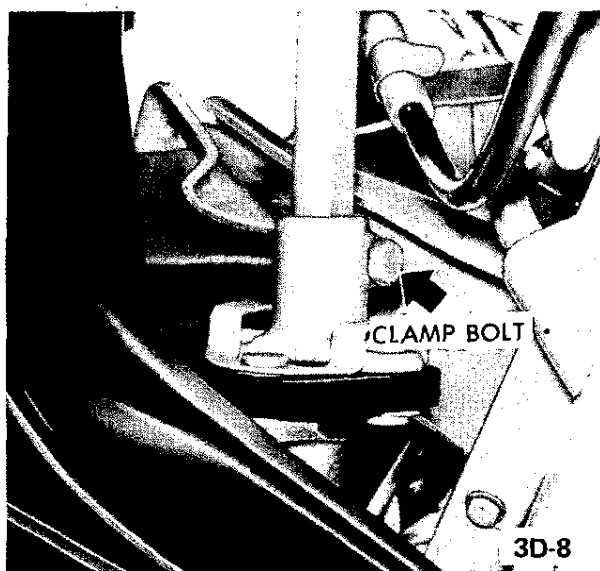


Figure 3D-8 • Removing Clamp Bolt

3. Remove cotter pin located on left and right tie rod end and unscrew nut.
4. Using Tool J-21687, press tie rod ends out of steering arms.
5. Disconnect steering gear housing from front suspension cross member and remove steering gear together with tie rods.

Installation • GT

CAUTION: Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

1. Position steering gear on front suspension cross member and torque attaching bolts to 18 lb.ft.
2. Position tie rod ball studs in steering arms; install nuts and torque to 29 lb.ft. Lock in position with new cotter pins.
3. Fully turn steering wheel so that flat or cutout surface on lower portion of steering shaft is parallel to flexible coupling bolt hole.
4. Install the lower end of steering shaft to the flexible coupling and adjust dimension between steering wheel hub and direction signal switch housing cover to $\frac{1}{8}$ and $\frac{3}{32}$ inch. Maintain adjustment by tightening flexible coupling bolt and nut to 15 lb.ft. Lock the bolt and nut in position with lock-plate tabs.

5. Reinstall stop bolt into steering column.

6. Full turn steering wheel both right and left. If any resistance is noticeable, it will be necessary to remove the steering column and correct the cause.

D. Installation (Opel 1900 • Manta)

CAUTION: Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

1. Prior to installation, set steering gear to high point. The steering wheel spokes point downwards in an oblique angle. The elongated cutout of the lower steering mast must coincide with the clamp bolt hole of the pinion flange.
2. Position steering gear on front suspension cross member and torque attaching bolts to 29 lb.ft.
3. Position tie rod studs in steering arms. Install nuts and torque to 29 lb.ft. Lock in position with new cotter pin.
4. Install the lower end of the steering shaft to flexible coupling and torque clamp bolt to 22 lb.ft.
5. Attach guard plate to both side members and lower deflector panel.

DISASSEMBLY AND ASSEMBLY OF STEERING GEAR ASSEMBLY WITH TIE RODS

Disassembly • GT

1. Carefully clamp gear assembly in soft jaw vise and slip clamps and rubber bellows off gear housing to expose area where ball joint screws into rack.
2. Bend up round edges of lockplates from tie rod ball studs and disconnect tie rod ball studs from rack. See Figure 3D-9). It is important that rack be held secure with open end wrench to prevent damage to rack teeth.
3. Loosen adjusting screw lock nut; remove adjusting screw from steering gear housing, and take out thrust spring and sintered bronze shell. See Figure 3D-11.
4. Rotate gear assembly in vise so that pinion shaft portion of assembly is held by vise, and remove pinion nut, flat washer, and special washer.

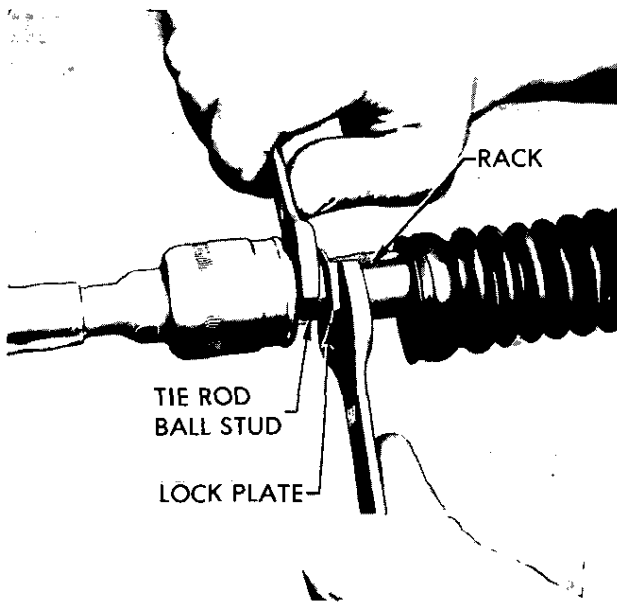


Figure 3D-9 Removing Tie Rods

5. Remove pinion shaft from gear assembly, and then withdraw rack from gear assembly.
6. From steering gear housing remove "O" rings from retainer and pinion bushing. Also take out thrust washer. See Figure 3D-17.

Disassembly (Opel 1900 - Manta)

1. Carefully clamp steering gear assembly in soft jaw vise.
2. Disconnect left and right tie rod end from respective axial joint (locknut). See Figure 3D-10. The ball joint of the tie rod end is maintenance-free, must not **be** disassembled and has to **be** replaced as an assembly only.

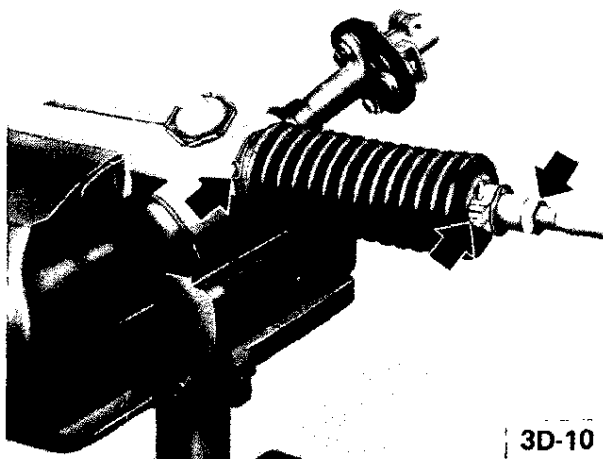


Figure 3D-10 Removing Tie Rod Ends from Axial Joint

3. Remove clamping wire and hose clamp from rubber bellows. Remove bellows from steering gear housing and axial joint. See Figure 3D-10.

4. Disconnect ball stud of axial joint from rack (lock plate, stop plate). To do this, counterhold rack with open-end wrench to avoid damage to the teeth. See Figure 3D-11. The axial joint is maintenance-free, must not be disassembled and has to be replaced as an assembly only.

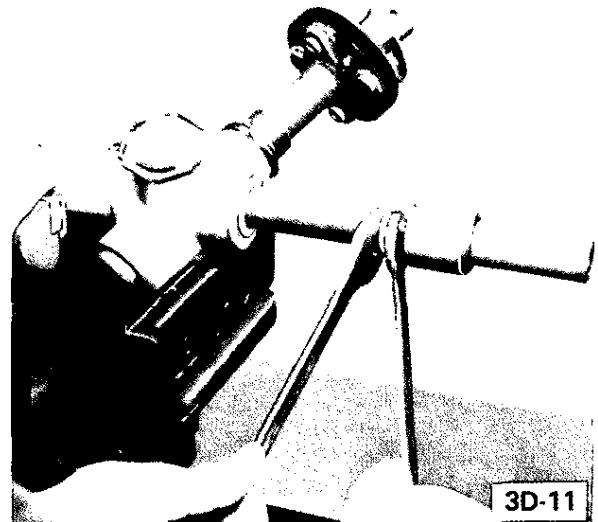


Figure 3D-11 Removing Axial Joint

5. Loosen adjusting screw locknut, screw out adjusting screw and remove thrust spring as well as bearing shell out of adjusting screw opening.

6. Remove sheet metal cap from steering gear housing and remove hex nut from pinion. Do not turn pinion in end position.

7. Pull pinion and rack out of steering gear housing.

Reassembly. GT

1. Clamp steering gear housing in a soft jaw vise as shown (see Figure 3D-17) and reassemble new "O" rings onto retainer and pinion shaft bushing. Also install thrust washer onto pinion bushing.

Coat all moving parts during reassembly with suitable steering gear lubricant. Fill long end of housing with approximately 1-3/4 oz. steering gear lubricant.

2. Insert long toothless end of rack into short end of housing until rack protrudes equally (approximately 2- 7/8 inch) out of both ends of housing. See Figure 3D- 13.

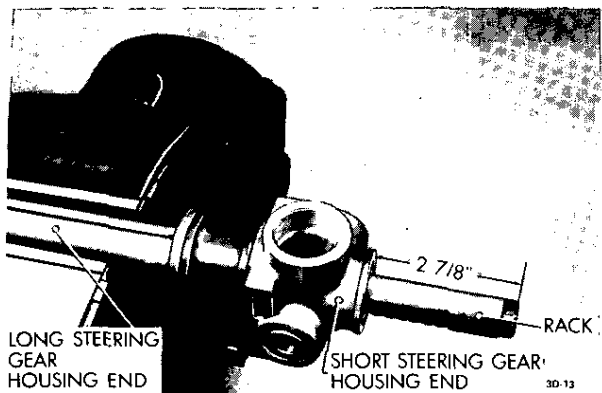


Figure 3D-13 Steering Gear Housing With Rack

Check to insure that three air channels of sintered metal bushing (See Figure 3D-17) are not obstructed by lubricant. If air channels are blocked, a vacuum condition in the bellows **may result** during operation of the gear assembly. Under such circumstances, the bellows will be drawn inward and jam into the rack teeth.

3. Reassemble pinion shaft into gear assembly so that spline in pinion shaft meshes with twelfth tooth of the rack. Use pinion mounting sleeve J-21712 during installation of pinion shaft to avoid damage to "O" ring in pinion bushing. When reassembling pinion shaft into gear housing, be sure that pinion is so positioned that bolt hole in pinion shaft flexible coupling is on top and parallel to the rack. See Figure 3D-14.

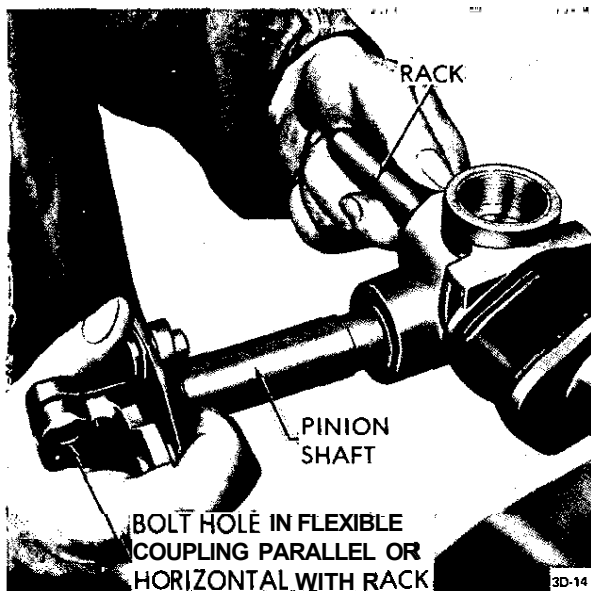


Figure 3D-14 Installing Pinion Shaft

4. Reassemble special washer, flat washer, and new pinion nut onto pinion shaft. Torque pinion nut to 11

lb.ft. Do not exceed torque due to possibility of jamming gear.

5. Place sintered bronze shell into steering gear housing **and** fill adjusting hole with Calcium Soap No. 2.

6. Reassemble thrust spring, adjuster screw and locknut on gear assembly.

Final adjustment of adjuster screw is performed after gear assembly and tie rods are installed in car. See Maintenance and Adjustments in this section for adjustment of steering gear.

7. Place rubber bellows, clamps, and new lock plates on ball stud portion of tie rods; and screw ball studs into rack while holding bent tab of lock plate against flat on rack. Torque ball studs 43 lb.ft. See Figure 3D-9. It is important that rack be held secure with open **end** wrench to prevent damage to rack teeth.

8. Bend **round** edges of lock plate over flat on ball stud to lock ball stud in position. See Figure 3D-15.

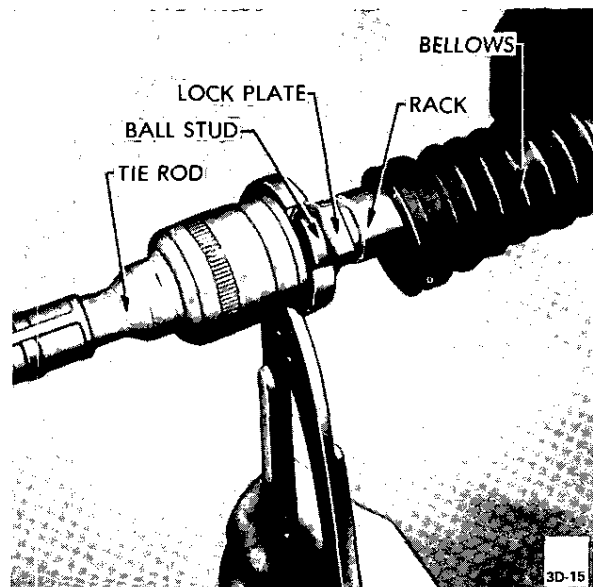


Figure 3D-15 Bending Lock Plate Over Ball Stud

9. Properly position rubber bellows and clamps over tie rod and gear housing and adjust clamps so that ends are pointing same direction as adjusting screw. Check that bellows is not twisted and will compress and expand properly.

Reassembly (Opel 1900 • Manta)

1. Clamp steering gear housing in a soft jaw vise and reassemble new "O" rings onto retainer and pinion shaft bushing. Also, install thrust washer onto pinion bushing.

Coat all moving parts during reassembly with **suita-**

ble steering gear lubricant. Fill long end of housing with approximately 1 3/4 oz. steering gear lubricant.

2. Insert long toothless end of rack into short end of housing until rack ends (A) protrude equally out of both ends of housing. See Figure 3D-16.

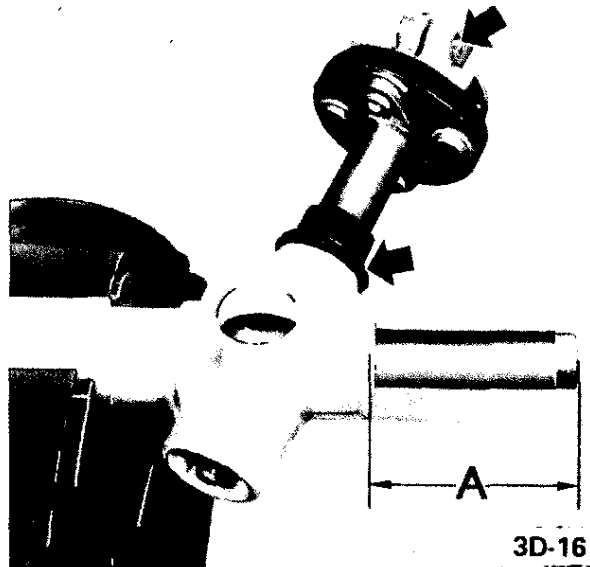


Figure 3D-16 - Steering Gear Housing With Rack

Check to insure that three air channels of sintered metal bushing are not obstructed by lubricant. If air channels are blocked, a vacuum condition in the bellows may result during operation of the gear assem-

bly. Under such circumstances, the bellows will be drawn inward and jam into the rack teeth.

3. Reassemble pinion shaft into gear assembly so that spline in pinion shaft meshes with twelfth tooth of the rack. Use pinion mounting sleeve J-21712 during installation of pinion shaft to avoid damage to "O" ring in pinion bushing. When reassembling pinion shaft into gear housing, be sure that pinion is so positioned that bolt hole in pinion shaft flexible coupling is on top and parallel to the rack. See Figure 3D-16.

4. Reassemble special washer, flat washer, and new pinion nut onto pinion shaft. Torque pinion nut to 11 lb.ft. Do not exceed torque due to possibility of jamming gear.

5. Place sintered bronze shell into steering gear housing and fill adjusting hole with suitable steering gear lubricant.

6. Reassemble thrust spring, adjuster screw and locknut on gear assembly. Torque locknut to 43 lb.ft.

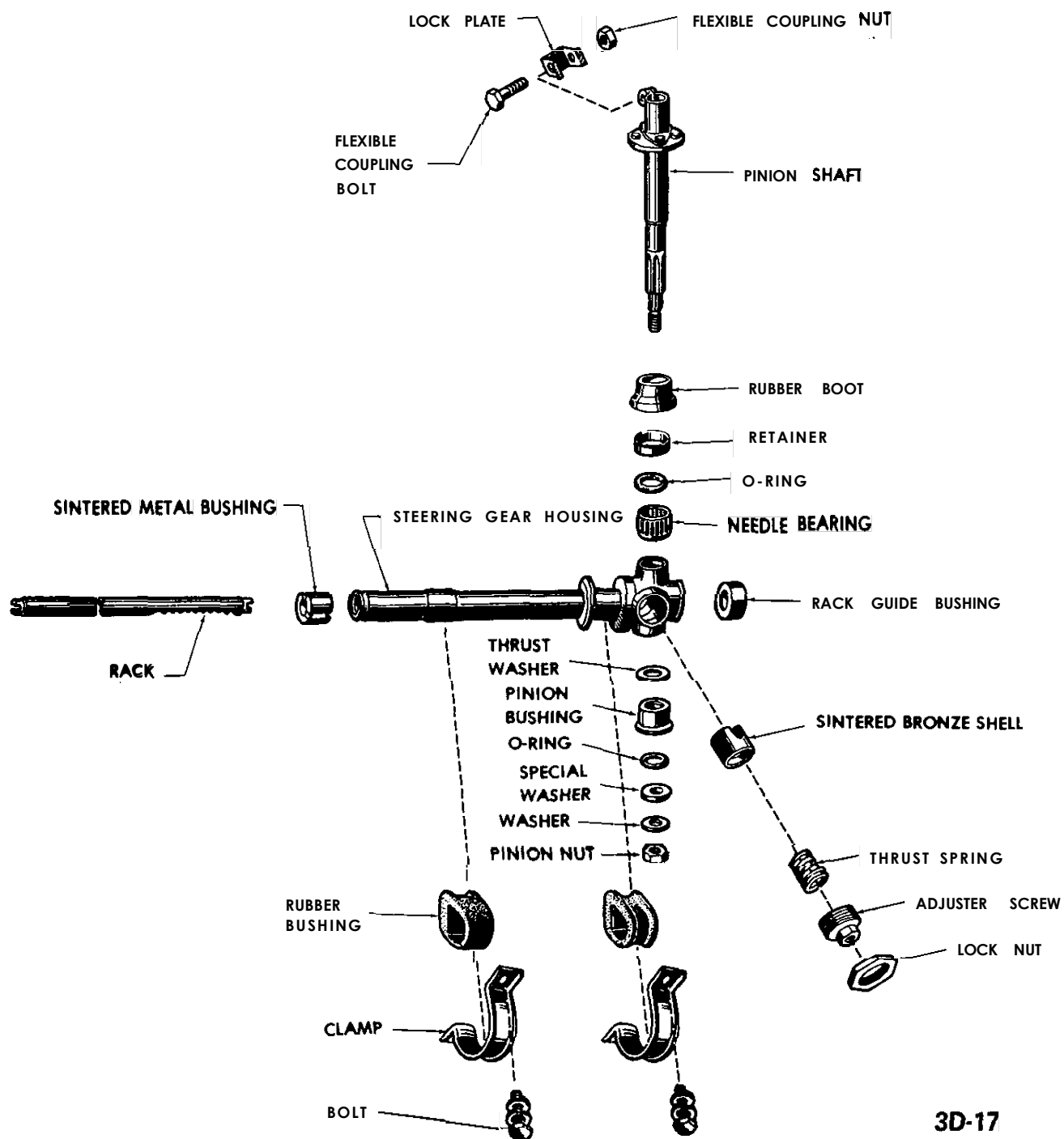
7. Screw ball stud of the axial joint together with stop plate onto both ends of the rack. Torque to 47 lb.ft. Counterhold rack with open-end wrench.

8. Slide rubber bellows onto axial joint and steering gear housing. Attach rubber bellows with loose clamp and clamping wire. Check that rubber bellows is not twisted.

SPECIFICATIONS

Tightening Specifications

Part	Location	Torque Lb.Ft.
Bolt	Flexible Coupling Clamp (GT)	15
Bolt	Flexible Coupling Clamp (1 900 • Manta)	22
Nut	Tie Rod Ball • Connects to Rack (GT)	43
Nut	Ball Stud • Axial Joint to Rack (1 900 • Manta)	47
Nut	Tie Rod Lock Nut (1900 • Manta)	49
Bolt	Steering Gear Housing to Front Suspension Crossmember (GT)	18
Bolt	Steering Gear Housing to Front Suspension Crossmember (1 900 • Manta)	29
Nut	Adjusting Screw Lock Nut	43
Nut	Pinion	11
Nut	Tie Rod to Steering Arm	29



3D-17

Figure 3D-17 Steering Gear Assembly Exploded View