VOLKSWAGEN TYPE 1 WORM & ROLLER

Type 1

DESCRIPTION

STEERING GEAR

Exc. Super Beetle – Vehicles are fitted with a worm and roller type steering gear. The steering casting is attached to axle beam by means of a clamp. The worm spindle is meshed with the steering roller shaft through a needle bearing mounted roller. The worm is adjusted by a shim under the upper ball bearing. The meshing depth of the roller in the worm is adjusted with the aid of a screw in the steering case cover. This type steering gear allows for play-free steering through the central range. As the steering wheel is turned, a steadily increasing amount of play is noticeable while vehicle is stationary; however, this play is not noticeable while driving due to self-centering action of the front wheels.

Super Beetle – Models use a steering gear which uses essentially the same principle as other Type 1 models. In the steering box, an adjustable worm spindle meshes with roller mounted on pitman arm shaft. Spindle is mounted between two thrust bearings. Pitman arm shaft is mounted on bronze bushing in housing. Both worm spindle and pitman arm shaft are adjustable. Play-free central steering range is set with a special centering bolt and by the alignment of the pitman arm with gear housing mark.

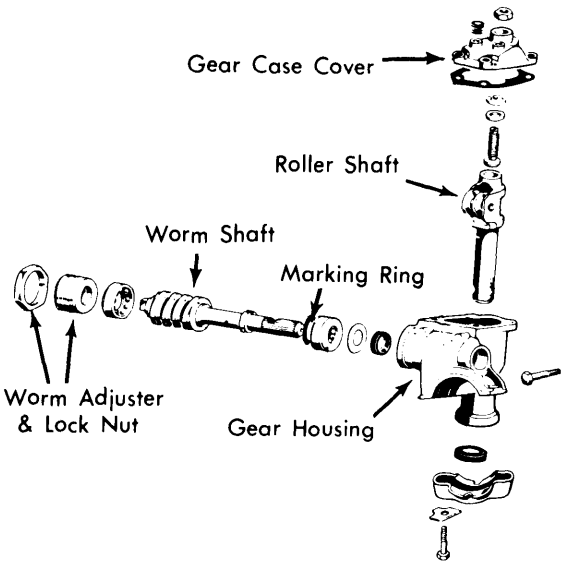

Fig. 1 Typical Worm and Roller Gear Assembly

STEERING LINKAGE

Exc. Super Beetle – Vehicles have two maintenance-free tie rods located behind the front axle. Both tie rods are adjustable. Movements of pitman arm are transmitted to wheels by tie rods. Road shocks are absorbed by hydraulic steering damper. Damper is attached to front axle and tie rod.

Super Beetle – Vehicles have three maintenance-free tie rods. Center tie rod is fixed in length and outer tie rods are adjustable. Movement of pitman arm is transmitted by center tie rod to idler arm. Two adjusting bolts in idler arm bracket limit movement of front wheels. Hydraulic steering damper is attached to front axle carrier and center tie rod.

ADJUSTMENT – ON VEHICLE

STEERING GEAR

All Models – Align wheels in straight-ahead position. Move steering wheel lightly, holding outer end of spoke, until resistance is felt. Movement of wheel must not exceed 1" (.60", Super Beetle), measured at wheel circumference. Excessive play may be caused by axial play of worm spindle, play between roller and worm, worn universal joint shaft (Super Beetle), or axial play or roller. Check these in the following order:

Axial Play of Worm Spindle (Exc. Super Beetle) – Turn wheel to full left or right position. Loosen lock nut on worm spindle adjuster and turn spindle while tightening adjuster until no play is felt at coupling. Hold adjuster and torque lock nut. There should be no tight spots when spindle is turned.

Universal Joint Shaft Wear – Remove shaft, check and replace parts as necessary.

Roller-to-Worm Play – 1) If above adjustments fail to rectify play, roller-to-worm setting must be adjusted. Adjustment can be made with vehicle raised, but must be checked with vehicle on the ground.

2) Turn steering wheel 90° left or right. Loosen pitman arm shaft screw lock nut and turn screw out approximately one turn. *NOTE – Adjusting screw is accesible through hole in luggage pan.* Turn screw in until roller can be felt contacting worm. Hold screw and tighten lock nut.

3) With vehicle on ground, turn steering wheel 90° to each side and check play. If excess play is present on one side, repeat adjustment to that side. Check toe-in and set if necessary. Road test by cornering at 10-12 MPH. If steering wheel does not return to approximately 45° of center, adjustment is too tight.

Axial Play of Roller – If play cannot be eliminated by adjustments previously described, gear must be dismantled and axial play of roller checked. For procedures, *see Overhaul in this article.*

CENTERING STEERING GEAR

Super Beetle – Special centering bolt is screwed in through pitman arm until point just touches aluminum plug in housing. *See illustration.* After adjustment has been made, remove centering bolt.

VOLKSWAGEN TYPE 1 WORM & ROLLER (Cont.)

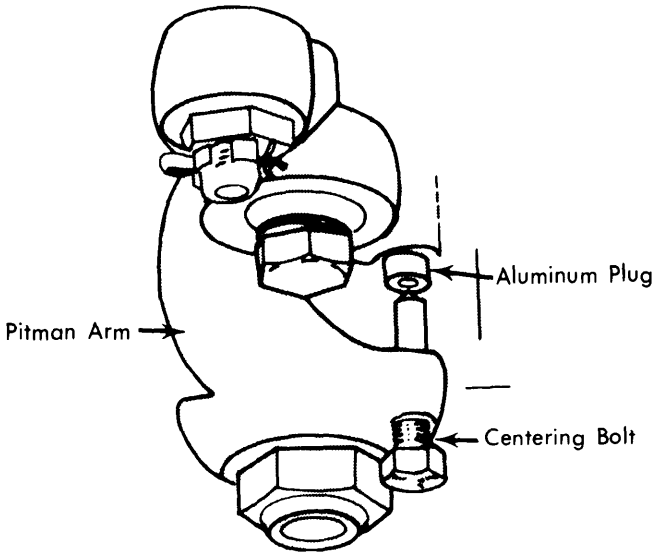

Fig. 2 Using Special Centering Bolt to Properly Position Gear in Middle

ADJUSTMENT – OFF VEHICLE

STEERING GEAR

Exc. Super Beetle – 1) Insert measuring head of special tool VW280 in mounting tube. Ensure feeler plate contacts worm spindle. Slide setting plate until appropriate pitman arm number is under mark according to the following:

Application	Pitman Arm No.
Type 1	
Sedan & Convertible	131 415 371

2) Turn pitman arm 9-13° right or left. *NOTE – 9-13° is applicable only if pitman arm shaft and/or worm spindle is replaced; otherwise use 5°.* Turn adjusting screw in until no further play is felt. Simultaneously move pitman arm slightly while holding worm. Torque lock nut to specification. Check play-free range at opposite lock. If play is felt within specified range, dismantle gear and replace shim: If play-free angle is greater than specified, use thicker shim; if less, use thinner shim.

3) When adjustment is set, press worm spindle oil seal in place. Remove housing cover and fill with 5.4 oz. suitable lubricant. Fill adjusting screw hole with same lubricant. Install new plastic plugs in housing. Replace cover with gasket, torquing bolts to specification. Recheck pitman adjustment. Mark center position with new marking ring and secure with paint.

Super Beetle – 1) – Use same procedures as steps **2** and **3** above (through replacement of oil seal). Fill housing with 5.75 oz. suitable lubricant. Add lubricant to adjusting screw hole. Replace cover and install new aluminum plug (for gear centering).

2) Align gear in center position. Place retaining ring for boot on worm spindle with lug in line with notch on housing. Place gear in press and apply two tons pressure to roller shaft. Torque center position bolt to 12 ft. lbs. (adjusting screw circlip will be forced out if roller shaft is not loaded).

NOTE – Some adjustments of various applications are included as part of Overhaul procedure.

REMOVAL & INSTALLATION

STEERING GEAR

NOTE – Position of steering gear on axle housing is controlled by two welded stops and cutouts in mounting clamp. Note position of clamp prior to removal and replace in same position.

Removal, Exc. Super Beetle – Detach pitman arm from gear shaft. Disconnect battery and horn ground cables. Remove bolts from upper flange of column coupling. Bend lock plate back for gear mounting clamp bolt, turn wheels for easy access, then unbolt and remove steering gear.

Installation, Exc. Super Beetle – To install, reverse removal procedure, using new lock plates and self-locking nuts where applicable. Check and set toe-in.

Removal, Super Beetle – Unbolt steering damper from pitman arm and press off tie rod end. Detach worm spindle from lower universal joint. Separate gear from sidemember and remove from vehicle.

Installation, Super Beetle – Attach gear to universal joint (insert bolt). Bolt gear on sidemember, then reconnect pitman arm to damper. Install tie rod end. Torque nut on universal joint bolt. Align nut on universal joint bolt. Align lug on dust boot retaining ring with notch on gear housing.

STEERING LINKAGE

Steering Damper Removal, All Models – Lift vehicle and remove front wheels. Unlock and remove screw in bracket (on axle beam). Remove nut at tie rod end or pitman arm and take damper off.

Steering Damper Installation, All Models – Reverse removal procedure, noting the following: Use new lock plate under screw on bracket. Lock plate should be installed so that the open end of plate points forward and short angled part is on the bracket.

Tie Rod Removal, All Models – Raise vehicle and remove front wheels. Remove nuts from tie rod ends. Detach steering damper from tie rod end. Press out tie rod ends, using suitable tool (VW 266h).

Tie Rod Installation, All Models – Install tie rod ends, with end having left-hand thread on left side. Tighten slotted nuts to specification and lock. Loosen nuts for tapered rings or clamps. Turn both ends on each rod in one direction to front or rear as far as possible so that the ends are properly aligned with each other. In this position, tighten nuts for tapered rings or clamps. Attach steering damper and adjust toe in.

OVERHAUL

STEERING GEAR

Disassembly, Exc. Super Beetle – 1) Bolt steering gear assembly onto suitable mounting tube and clamp in padded vise. Remove nut from pitman arm and pull arm from roller shaft. Remove lock nut from roller shaft adjusting screw and detach cover plate.

2) Protect roller shaft splines, turn steering worm to center position and push shaft out of housing. Empty housing of lubri-

VOLKSWAGEN TYPE 1 WORM & ROLLER (Cont.)

cant. Remove circlip, adjusting screw and shim for pitman arm shaft adjustment.

3) Screw out worm spindle adjuster and remove marking ring. Tap out worm spindle and lower bearing. Remove upper bearing and seal by driving inward.

Disassembly, Super Beetle – Remove pitman arm. Attach gear to holding tool. Remove housing cover. Extract roller shaft by turning worm spindle and pushing up. Remove circlip, adjusting screw and washer from roller shaft. Unscrew adjuster nut from worm spindle and remove spindle. Tap out seal, washer, and upper bearing.

Reassembly, All Models – 1) When assembling gear, worm and roller must be adjusted with equal free play range on either side of center position. Adjustment is made using shim on worm spindle. Insert worm spindle into housing with upper bearing and a medium thickness shim (for initial adjustment); do not install oil seal yet.

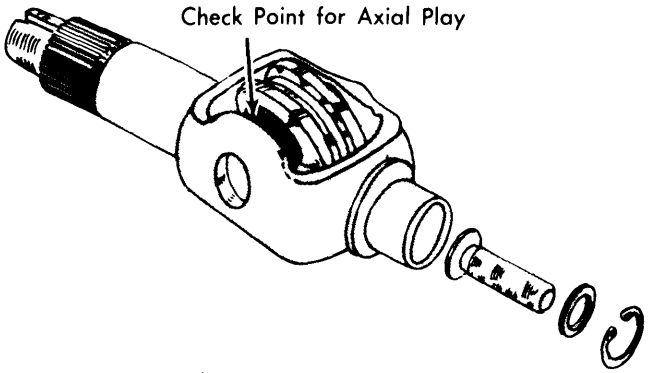

Fig. 3 Showing Roller and Axial Play Adjusting Screw

2) Install lower bearing. Install worm adjuster and tighten enough to seat bearings. Slacken adjuster and retighten until 8-14 INCH lbs. (9.2-16.1 cmkg) is required to turn the worm. Tighten adjuster lock nut.

3) Assemble roller shaft. Check axial play of roller with feeler gauge. Maximum allowable play is .0015" (.04 mm). If excessive play is found, replace roller shaft. Place adjusting screw and shim into roller shaft (secure with circlip).

4) Attach roller shaft to housing cover. Insert assembly in housing at right angle to roller. Torque cover bolts. Install and torque pitman arm. *NOTE – Do not refill housing with lubricant until all adjustments are made.*

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Steering Damper-to-Axle/Frame	
Exc. Super Beetle	29-32 (4.0-4.4)
Super Beetle	43 (6.0)
Tie Rod-to-Pitman Arm	
All Models	22 (3.0)
Wheel Lock Adjusting Screw	
Super Beetle	11 (1.5)
Pitman Arm-to-Sector	
Exc. Super Beetle	50 (7.0)
Super Beetle	72 (10.0)