1971-73 SAGINAW BALL BEARING WORM & NUT

American Motors
Chrysler Corp.
Ford Motor Co.
General Motors.
Jeep

DESCRIPTION

Recirculating ball nut type. Ball nut, mounted on the worm, is driven through steel balls which circulate in helical grooves in both the worm and nut. Ball return guides, attached to the nut, serve to recirculate the two sets of balls in the grooves. When steering wheel is turned to right, nut moves upward; when turned to left, nut moves downward. The teeth on sector (forged as part of pitman shaft), and the ball nut, are so designed that a tighter fit exists between the two when the front wheels are straight ahead. Proper engagement between sector and ball nut is obtained by an adjusting screw, which moves pitman shaft endwise, permitting desired engagement of tapered teeth of the ball nut and sector gear. Worm bearing adjuster can be turned to provide proper preloading of the upper and lower bearings.

ADJUSTMENT

NOTE – Before any adjustments are made to steering gear, check for binding at frame bracket mounting bolts and at instrument panel bracket or flexible coupling. Steering shaft should turn through full range, in both directions, without binding. Binding indicates misaligned steering gear on mountings or coupling. Rough spots indicate damaged bearings or parts. Hard pull indicates excessive preload adjustment. Steering gear adjustments may be made with gear on or off the car.

NOTE – Always set worm bearing preload before betting sector shaft lash.

Worm Bearing Preload

1) If steering gear on car, remove horn ring or horn button (for access to steering shaft nut), and remove steering arm from sector shaft (pitman shaft) using a suitable puller.

2) Turn steering wheel to 1/2 turn from either end position (approximately 2 turns from straight ahead position), loosen pitman shaft adjusting screw locknut and back off adjusting screw several turns.

3) Install an inch-pound torque wrench on steering shaft nut (or attach spring scale at right angles to steering wheel spoke as directed in specification table), turn steering wheel at least one turn toward center position while noting torque required to keep steering gear turning. If this turning torque not correct (see Specifications), adjust as follows:

4) Loosen adjuster locknut, turn worm bearing adjuster clockwise to increase turning torque, or counterclockwise to decrease turning torque. Hold adjusting nut and tighten locknut securely. Recheck turning torque.

Ball Nut & Sector Shaft

1) Turn steering wheel to centered or straight ahead position, install inch-pound torque wrench on steering wheel nut (or attach spring scale at right angles to steering wheel spoke as directed in specification table), tighten pitman shaft adjusting screw while turning steering wheel through center position until torque wrench reading is correct as noted in specification table. Hold adjusting screw from turning and tighten locknut securely. Recheck turning torque and readjust as necessary.

2) After adjustments completed, install pitman arm on pitman arm shaft, install lockwasher and nut, tighten nut to specified torque.

WORM BEARING PRELOAD

Car Model	① Bearing Preload (In. Lbs.)
American Motors (All Models)	② 1/8-3/8
Chrysler Corp. (All Models)	1 1/8-4 1/2
Ford Motor Co. (All Models)	4-5
Jeep (All Models)	8
General Motors:	
Buick (All Models)	5-8
Chevrolet (All – including Vega)	4-6
Oldsmobile (All Models)	5-8
Pontiac (All Models)	5-8

BALL NUT & SECTOR SHAFT

Car Model	① ③ Mesh Load (In. Lbs.)
American Motors (All Models)	② 3/4-1 1/8
Chrysler Corp. (All Models)	8-11
Ford Motor Co. (All Models)	9-10
Jeep (All Models)	18
General Motors:	
Buick (All Models)	④ 4-10
Chevrolet (All - including Vega)	⑤ 5-9
Oldsmobile (All Models)	⑥ 4-10
Pontiac (All Models)	⑤ 4-10

① – Measured with In. Lb. torque wrench on steering wheel nut (except as noted).

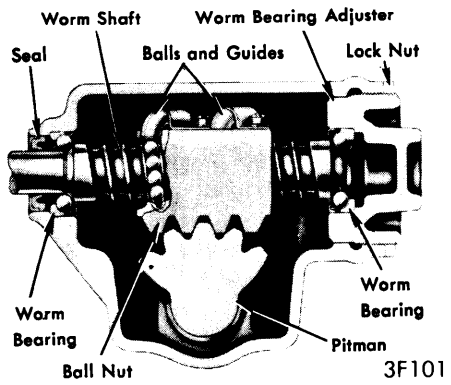
② – Lbs. as measured on spring scale hooked on steering wheel spoke.

③ – Total including Worm Bearing Preload except as noted.

④ – In excess of worm bearing preload. Total reading not to exceed 18 In. Lbs.

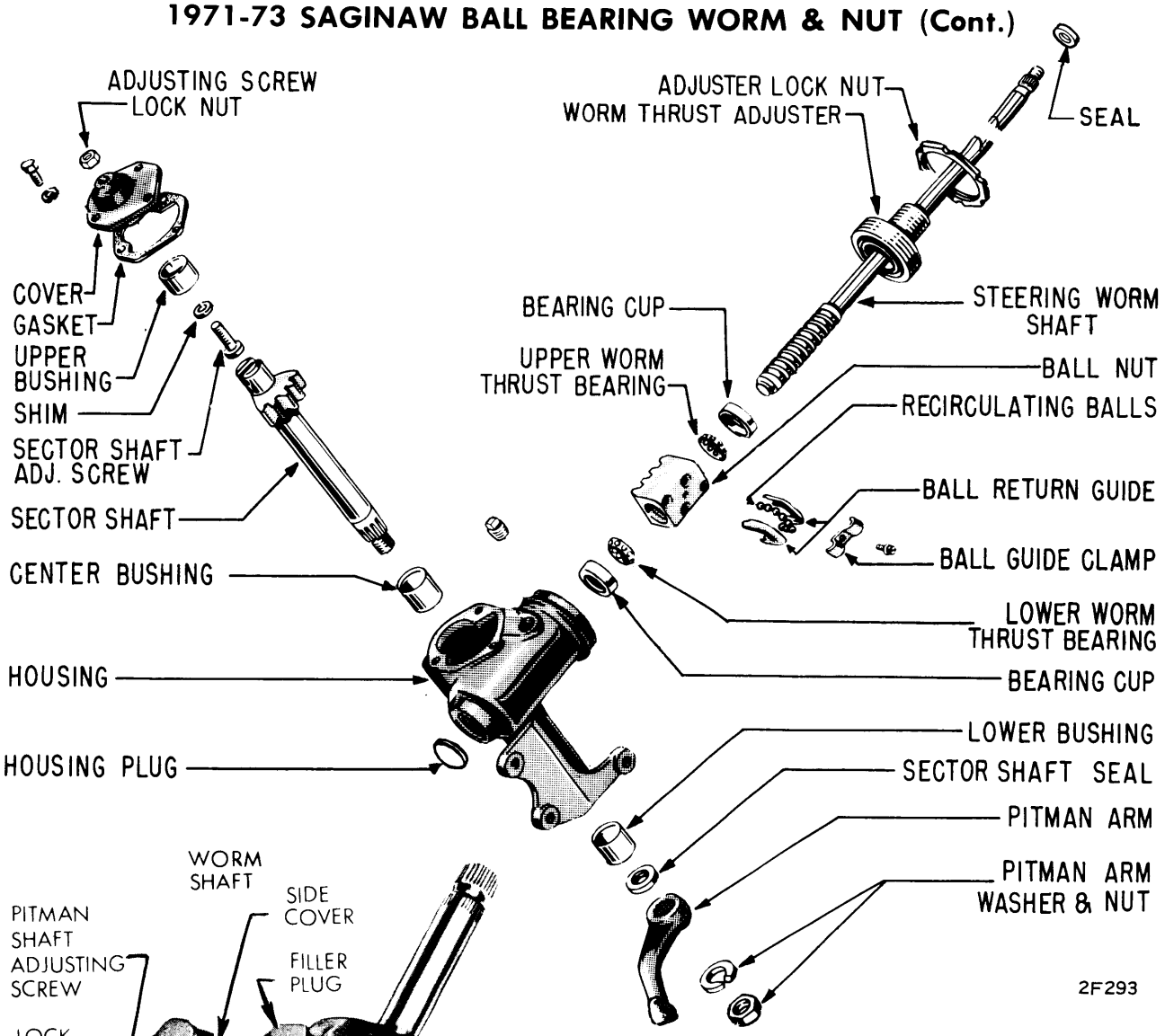
⑤ – In excess of worm bearing preload. Total reading not to exceed 16 In. Lbs.

⑥ – In excess of worm bearing preload.

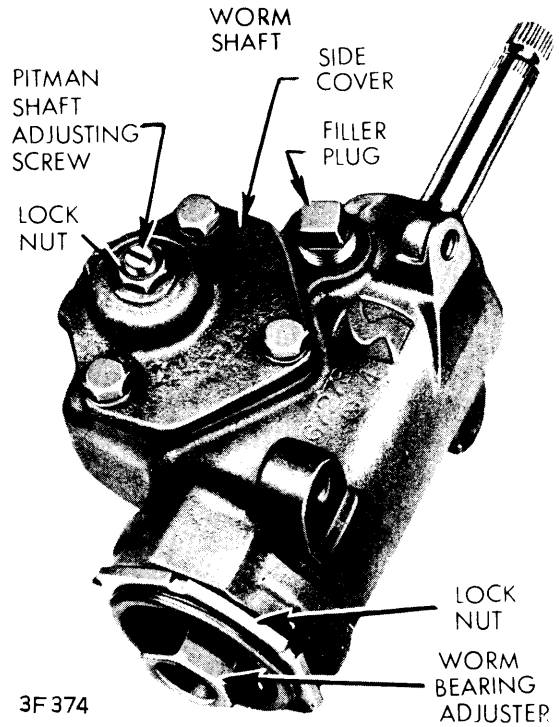


CUT-AWAY VIEW – MANUAL STEERING GEAR

1971-73 SAGINAW BALL BEARING WORM & NUT (Cont.)



SAGINAW BALL BEARING WORM & NUT STEERING GEAR



STEERING GEAR ADJUSTMENT LOCATIONS (TYPICAL)

REMOVAL & INSTALLATION

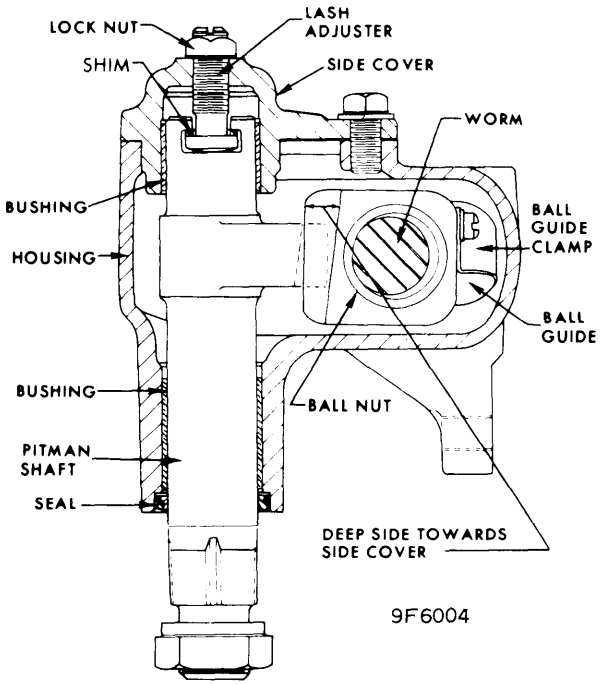
Steering Gear

NOTE – Steering gear is removed after disconnecting pitman arm from sector shaft, and steering shaft at flexible coupling (where used). Any special instructions, for various models, are listed below. To install, reverse removal procedure.

American Motors, All Models – When reinstalling, center steering gear with index mark up. Mark on shaft of flange must be aligned at assembly. Tighten flexible coupling bolts to 20 ft. lbs. and pinch bolt to 30 ft. lbs. Tighten gear mounting screws to 60 ft. lbs. and pitman arm nut to 115 ft. lbs. *NOTE – Whenever steering gear assembly is removed or mounting bolts loosened, steering column must be realigned.*

1971-73 SAGINAW BALL BEARING WORM & NUT (Cont.)

Chrysler Corp., All Models – *CAUTION – To avoid damage to the energy-absorbing steering column, it is recommended that the column be completely detached at the floor and at the instrument panel before steering gear is removed.* To remove gear, remove steering arm retaining nut and lockwasher from under the car, use a suitable puller C-4150, or equivalent, to remove steering arm from shaft. Remove gear-to-frame retaining bolts and lift steering gear out. To install, reverse removal procedure, tighten retaining bolts to 100 ft. lbs. torque, and tighten steering arm nut to 175 ft. lbs. torque.



STEERING GEAR – SECTIONAL VIEW

Ford Motor Co., All Models – When removing, to obtain clearance on some models equipped with standard transmission, it may be necessary to disconnect the clutch linkage. On some 8-cylinder models, it may be necessary to lower the exhaust system. Remove bolts retaining flex coupling to steering shaft, remove nut and lockwasher retaining pitman arm on sector shaft, then use suitable puller (T64P-3590-F) to remove arm from shaft. *CAUTION– Do not hammer on puller on shaft as this will damage steering gear.* Remove gear-to-side rail retaining bolts and lift steering gear out. To install, reverse removal procedure, tighten gear-to-frame bolts to 50-65 ft. lbs. torque, connect flex coupling, position pitman arm on sector shaft, install nut and lockwasher and tighten nut to 150-225 ft. lbs. torque.

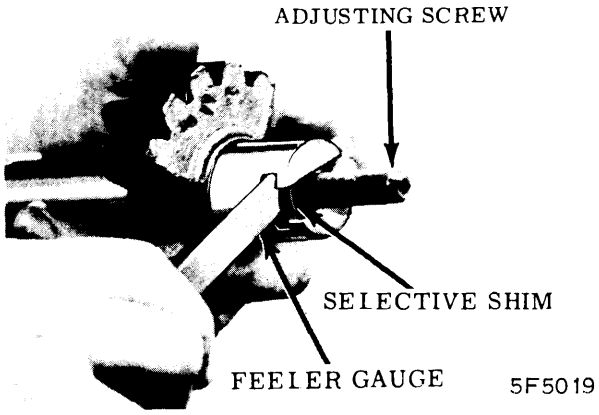
Jeep Models – Disconnect flexible coupling bolts. Remove pitman arm using puller J-5566-04, or equivalent. Remove steering gear mounting screws and lower gear. When installing, center steering gear with index mark up. Mark on shaft flange must be aligned at assembly. Install flexible coupling bolts, and tighten to 20 ft. lbs. Tighten pinch bolt to 30 ft. lbs. Tighten gear mounting screws to 60 ft. lbs. and install pitman arm and torque to 115 ft. lbs. *NOTE – After tightening pitman nut, stake threads to insure retention.*

Buick, All Models – When removing pitman arm from pitman shaft, do not hammer on end of puller. If necessary, tapping on side of pitman arm may help in removing arm. When reinstalling, tighten steering gear to frame bolts to 70 ft. lbs. and pinch bolt to 30 ft. lbs. Tighten pitman arm nut to 160-210 ft. lbs. torque. *CAUTION – Be certain to reinstall coupling flange so that tab on flange is aligned with mark on steering stub shaft.*

Chevrolet, All Models – *NOTE – When installing, be sure coupling is installed far enough on wormshaft for coupling bolt to pass thru undercut on wormshaft.* Tighten steering mounting bolts to 70 Ft. Lbs. (30 Ft. Lbs. on Corvette). Tighten coupling flange bolt to 30 Ft. Lbs. and flange nuts to 20 Ft. Lbs. Install pitman arm, aligning marks on arm and shaft made before disassembly. Install washer and retaining nut and tighten nut to 185 Ft. Lbs. (140 Ft. Lbs. on Corvette and Nova, and 93 Ft. Lbs. on Vega).

Oldsmobile, All Models – Before installing the gear to frame, lubricate the frame pads where the gear bolts to frame, to prevent squeeks between the gear and frame. Tighten steering gear to frame bolts to 70 ft. lbs. and pitman arm shaft nut to 200 ft. lbs. torque. Tighten flex coupling nuts to 20 ft. lbs. and flex coupling-to-gear bolt to 30 ft. lbs. torque.

Pontiac, All Models – Tighten steering gear to frame bolts to 70 ft. lbs., tighten two flange attaching nuts and bolts to 20 ft. lbs. and tighten pitman arm nut to 185 ft. lbs.



CHECKING END CLEARANCE

OVERHAUL

Disassembly

CHRYSLER CORP. CARS BALL NUT DISASSEMBLY

NOTE – The ball nut and wormshaft are serviced as an assembly only, and are not to be disassembled. Do not remove or disturb ball return guides. Cross shaft cover assembly, including a needle bearing or bushing, is serviced as an assembly.

1971-73 SAGINAW BALL BEARING WORM & NUT (Cont.)

1) Mount steering gear on a fixture or clamp gear in a vise with worm shaft horizontal, turn worm shaft until sector gear is centered on worm nut (straight-ahead position), remove side cover attaching bolts. Tap lightly on end of sector shaft, or on Chrysler models, use arbor tool C-3875 (1 1/8" diameter shaft) or C-3876 (1 1/4" shaft) to follow up sector shaft as it is removed from housing. *CAUTION – Arbor must be left in housing to retain sector shaft needle bearings until shaft reinstalled.* If sector gear does not clear opening in housing, turn worm shaft slightly to line up gear with opening, remove sector shaft and side cover from housing as an assembly. Separate shaft from cover by loosening adjusting screw locknut and turning screw clockwise until free from cover. Remove adjusting screw from sector shaft slot using care not to lose shim on screw.

CHEVROLET VEGA NOTE – On this gear, adjusting screw is retained in end of sector shaft by a nut which is staked in place. Do not attempt to remove adjusting screw as entire assembly is serviced as a unit.

2) Scribe a locating mark on flexible coupling and worm shaft, remove coupling from shaft. Loosen worm shaft adjuster locknut (use special spanner wrench or brass drift), remove adjuster nut and bearing assembly (bearing retained in nut by a snap ring). Pull worm shaft and ball nut assembly out of housing (*CAUTION – Do not allow ball nut to run down to either end of worm which would cause damage to ball guides*). Remove second worm shaft bearing from end of worm shaft or from within housing.

3) *Do not disassemble ball nut unless there is indication of binding or tightness (On Chrysler Corp. models, ball nut and worm shaft are serviced as an assembly).* To disassemble, remove ball nut return guide clampscrew, clamp and guides. Invert assembly over a clean cloth and remove all balls from each circuit (turn worm shaft slowly from side to side to aid in ball removal). After all balls removed, nut will slip off worm shaft.

Inspection & Repair

Wash all parts with clean solvent and blow dry with air. Inspect worm and nut grooves and ball surfaces for scoring or pitting, inspect all bearings, bearing cups, shaft surfaces, bushings and oil seals for wear or damage, replace as required.

Sector Shaft Bushings & Bearings – If necessary to replace these parts, press or pry oil seal out, then press old bushings (needle bearings on Chrysler Corp.) out and use correct tools to press new parts in to same position in housing. *NOTE – Side cover bushing (or bearing) should not be removed, the entire side cover assembly is serviced as an assembly.*

Worm Shaft Bearings – To remove bearing from adjuster, use screwdriver to pry out bearing retainer ring, lift out bearing. To remove bearing races, use suitable puller and slide hammer to pull bearing race, or use punch to tap race out being careful to drive race out evenly. Use suitable tools to press new bearing races in place.

Oil Seals – To replace oil seals, pry or drive old seals out. Use suitable driver to install new seals (socket or sleeve which will bear on outer diameter of seal without damaging seal lip).

Reassembly

►*BALL NUT REASSEMBLY NOTE* – Some steering gears have ball nut guides with top loading hole for the balls. To assemble this type, coat inside of worm, ball nut and guides with oil and install guides into ball nut with nut installed on worm. Load all balls through holes in guide and then install guide clamp. *NOTE – Clamps for side loading guides are not the same. Do not interchange or balls will fall out.*

1) Lubricate all seals, bushings and bearings before assembly. Place worm shaft flat on bench and slip nut over worm with ball guide holes up and shallow end of rack teeth to left of steering wheel position.

2) Divide ball bearings to provide an equal number for each circuit. Fill each of the return guides with balls, using vaseline to hold balls in place. Insert remaining balls in each circuit of the ball nut. Rock steering shaft slightly to aid in installing balls. Install return guide clamp and screws. *CAUTION – Do not rotate shaft while installing balls, balls may enter crossover passage between circuits causing improper operation.*

3) Place bearing on shaft above worm, center ball bearing nut on worm; then slide steering shaft, bearing and nut into housing. *NOTE – Do not damage steering shaft seal in housing.* Place bearing in worm adjuster, install bearing retainer, and install adjuster and locknut on housing. *NOTE – Adjuster should be installed just tight enough to hold bearings in place. Final adjustment will be made later.*

4) Install pitman shaft adjusting screw and selective shim in pitman shaft. *NOTE – Screw must be free to turn but have no more than .002" end play. For proper clearance, shims are furnished in four thicknesses: .063", .065", .067" and .069".*

5) On General Motors cars where steering gear is packed with 11 ozs. (9 ozs. on Vega) of special lubricant (GM Specification GM4673M or equivalent), lubricant should be installed during reassembly as follows: Rotate shaft until ball nut is at one end of travel, then pack as much lubricant as possible into housing without losing it out sector shaft opening, then rotate shaft so that ball nut is at opposite end of travel and pack other end of housing with lubricant. After sector shaft installed (without side cover), pack remaining portion of lubricant into housing.

6) Turn worm shaft so that ball nut is at center of travel, Insert sector shaft in housing using care that splined end of shaft does not damage oil seal and make certain center tooth on sector meshes with center space of ball nut. On General Motors cars, pack remaining portion of lubricant into housing. Place new side cover gasket on housing, position side cover on gasket by reaching through adjusting screw hole with a screwdriver and turning adjusting screw counterclockwise into cover until screw bottoms and side cover is seated against gasket, then back screw off one turn and install locknut loosely (adjustment will be made later). Install side cover bolts and tighten to specified torque.

7) On steering gears other than General Motors, fill gear with correct amount of specified lubricant through filler plug hole (or one side cover bolt hole). Adjust steering gear (see Adjustments).