FRONT SUSPENSION

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The "wishbone" type independent front wheel suspension allows either front wheel to react to changes in the road surface without appreciably affecting the opposite wheel (Fig. 3-1). The major units of the front suspension system are the steering knuckle, knuckle support, upper and lower control arms, coil spring, shock absorber, and stabilizer.

The steering knuckle (Figs. 3-2 and 3-3) is attached to the knuckle support by means of a hardened steel king pin which is carried in press fitted steel backed bronze bushings.

The bushings have an oil groove in the inner circumference provided with a lubrication hole that indexes with a similar hole in the steering knuckle.

An "O" ring seal is located below the upper steering knuckle bushing to insure retention of lubricant in the king pin bearing surfaces.

A ball thrust bearing is placed between the lower surface of the knuckle support and steering knuckle to reduce the force necessary to turn the wheels.

The knuckle support is pivoted by a threaded pin and bushing at both top and bottom, to the outer ends of two "V" shaped control arms. The upper

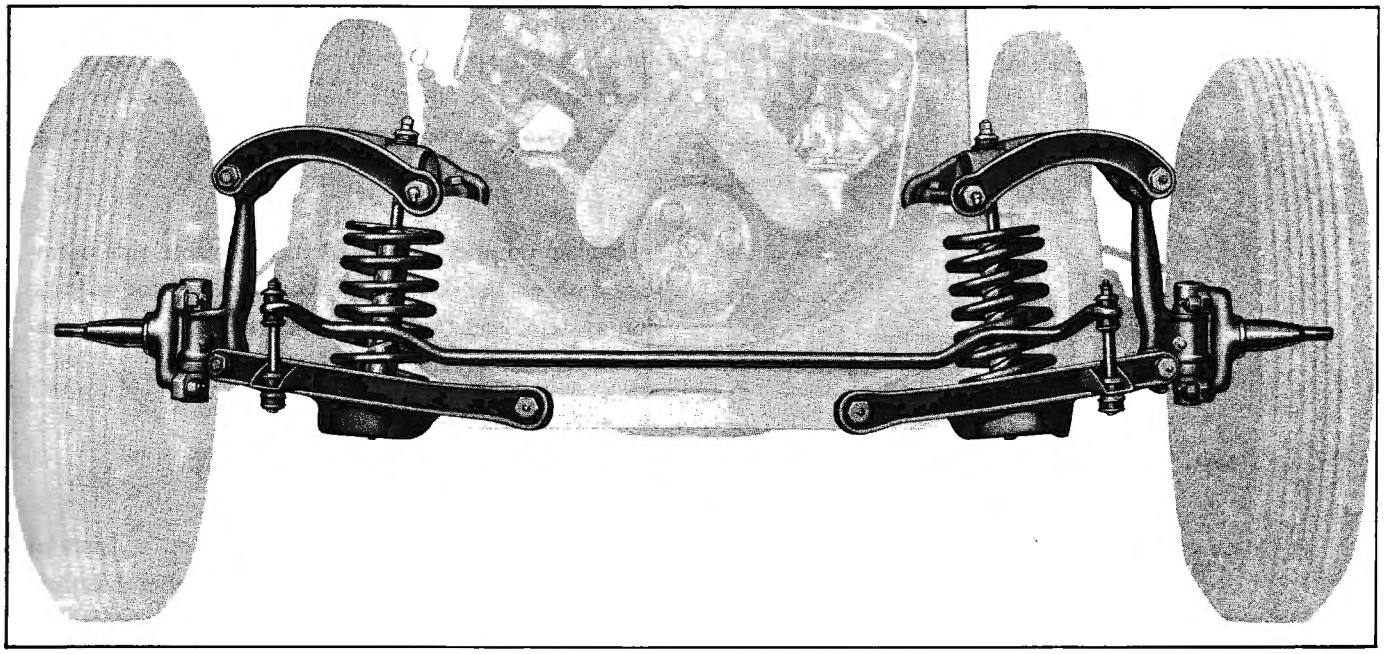


Fig. 3-1 Front Suspension

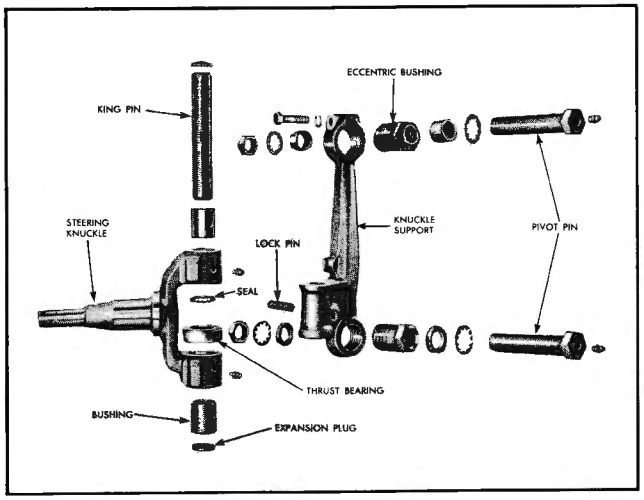


Fig. 3-2 Steering Knuckle and Related Parts

bushing is eccentric so that the front wheel camber and caster may be adjusted by turning this bushing, thereby moving the upper end of the knuckle support on the threaded eccentric section. The inner ends of the control arms pivot on shafts attached to the car frame.

The upper control arm inner shafts are solid construction type while the lower control arm inner shafts are three piece construction type consisting of shaft and two flanges welded to the shaft (Fig. 3-4).

The upper ends of the front coil springs seat in the frame front cross member. The lower ends of the springs are supported in stamped seats fastened to the lower control arms.

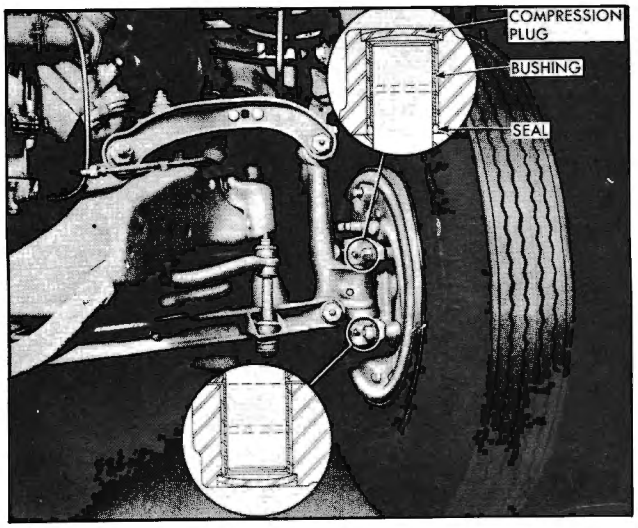


Fig. 3-3 King Pin Bushings

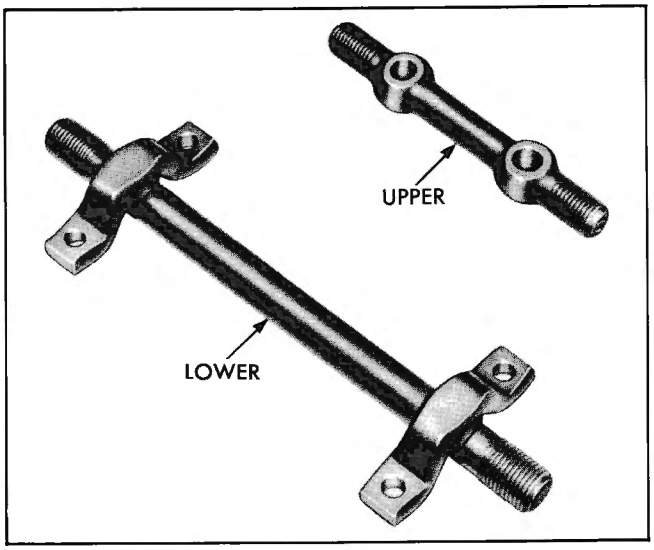


Fig. 3-4 Upper and Lower Control Arm Shafts

A direct acting shock absorber of sealed construction is carried inside each front coil spring. The upper stud on the shock absorber is fastened to a bracket on the front cross member by a nut and lock nut. The bottom shock absorber stud fastens to the spring seat with a nut and lock nut. Noise insulation is provided by rubber grommets which fit over the shock absorber studs and prevent metal to metal contact between each stud and metal attaching parts.

A front end stabilizer is used to provide stability and control body roll. It is fastened to the frame ahead of the springs with rubber mounts and is fastened at each end to the lower control arms by steel links having rubber grommets at their connecting ends.

Rubber bumpers attached to the frame side members cushion the downward movement of the suspension system, and bumpers attached to the lower control arms cushion the upward movement.

PERIODIC SERVICE

Periodic service of the front suspension consists of regular lubrication as outlined in the General Lubrication Section. No servicing of shock absorbers can be made since they are sealed at the factory. In case of malfunction, they should be replaced.

ADJUSTMENTS ON CAR

FRONT END ALIGNMENT—DEFINITIONS

Proper adjustment of the following related front end factors constitutes wheel alignment:

CASTER is the forward or backward tilt of the top of the king pin as compared to a true vertical position (Fig. 3-5). If the tilt of the pin is backward as shown, caster is positive; if forward, caster is negative.

CAMBER is the outward tilt of front wheels at the top as shown in Fig. 3-6.

KING PIN INCLINATION is the inward tilt of the king pin at the top (Fig. 3-6).

TOE-IN is the drawing together of the front wheels so that they are closer at the front "B" than at the back "A" as shown in Fig. 3-7.

TOE-OUT ON TURNS is the relationship between front wheels on turns. Since the front wheels must turn on different radius circles, the steering arms are inclined inward at the back to provide the correct turning angles (Fig. 3-8).

Since the above factors are inter-related, the average wheel alignment job involves a general check-up and correction which can be performed most efficiently by accurate testing and correcting equipment.

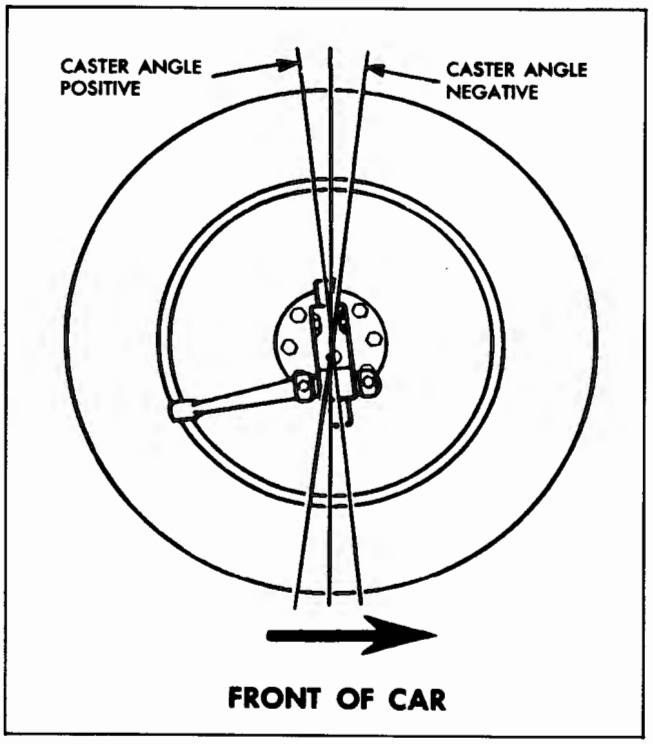


Fig. 3-5 Caster Angle

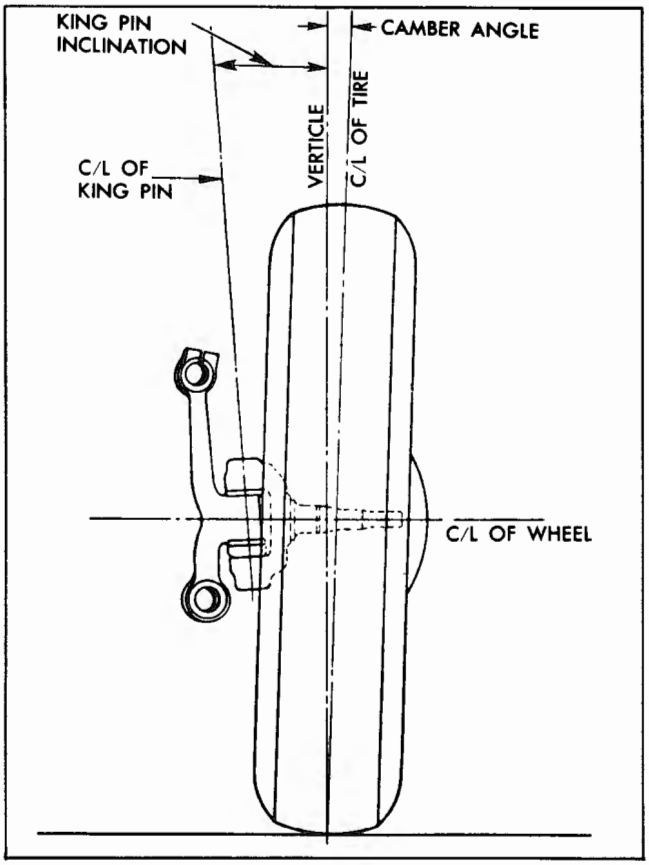


Fig. 3-6 Camber and King Pin Inclination

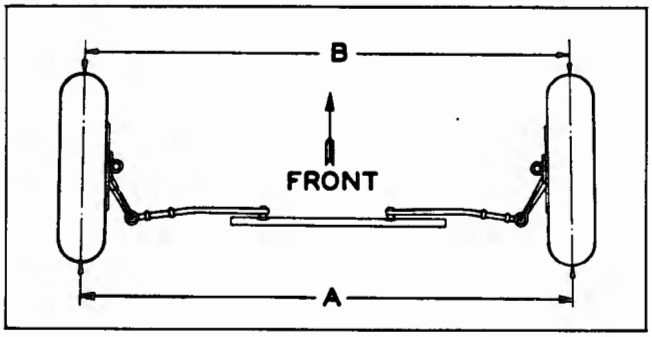


Fig. 3-7 Toe-in

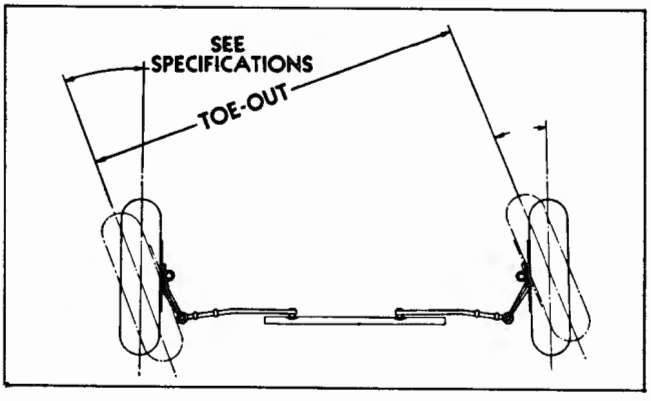


Fig. 3-8 Toe-out on Turns

INSPECTION BEFORE CHECKING FRONT END ALIGNMENT

Before any attempt is made to check or adjust camber, caster, toe-in and king pin inclination, the following checks should be made on items which will affect steering of the car:

1. Check tire inflation and bring to recommended pressure.

2. Check front wheel bearing adjustment and correct if necessary.

3. Check for looseness of king pin. If, with properly adjusted wheel bearings, the top of tire can be moved in and out as much as 1/8" (with hands at top and bottom of tire, pushing with one while pulling with other) the bushings are excessively loose and must be replaced before alignment readings have any value. (Do not mistake the normal clearance in pivot shaft threaded bushings for king pin looseness.)

4. Check for looseness of tie rod ends and replace if necessary.

5. Check for run-out of wheels and tires which must not exceed 1/8".

6. Check wheels and tires for excessive unbalance which would affect steering.

7. Check shock absorbers for action and replace if defective.

8. See that car sets level by measuring vertical distance from top of lower control arm to underside of frame at a point directly in line with shock absorber, as shown in Fig. 3-9. This is commonly called front end "jounce" space.

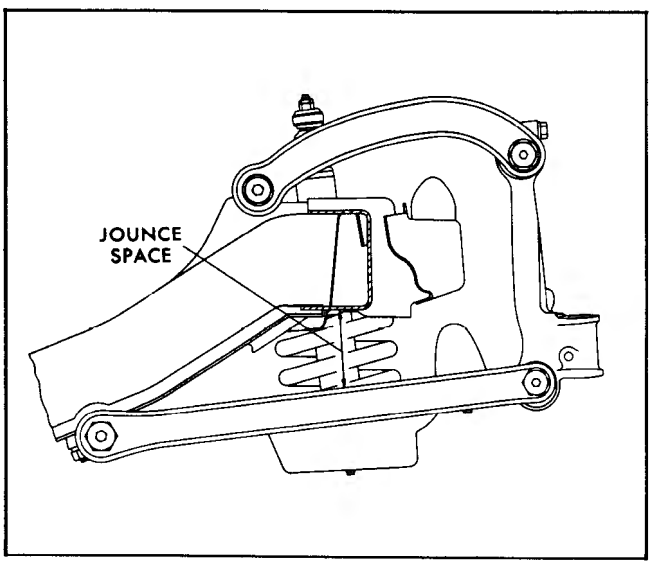
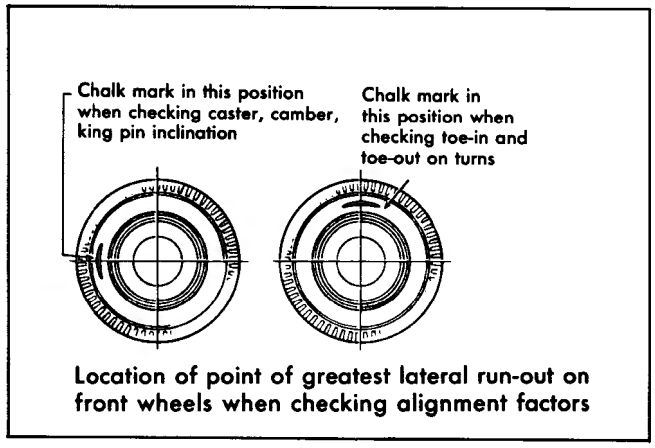


Fig. 3-9 Jounce Space Measurement



Location of point of greatest lateral run-out on front wheels when checking alignment factors

Fig. 3-10 Wheel Position for Checking Alignment

CHECKING FRONT END ALIGNMENT

Point of greatest run-out of front wheels and tires must be marked so wheels can be positioned as shown in Fig. 3-10 when checking alignment. To mark wheels, hold a piece of chalk against the wheel rim or sidewall while wheel is spinning. Chalk will mark wheel or tire at point of greatest run-out.

Before checking front end alignment, jounce the car up and down at both the front and rear bumpers to make certain it is setting in its normal position. This is very important since caster and camber vary somewhat as the front of the car moves up and down. The specifications for front end alignment are based on the normal "curb weight" position of the car. Curb weight includes all equipment plus a full tank of gasoline. NOTE: Since the cars are quite frequently stiff when new, it is impossible to find the normal position by jouncing. For this reason, caster, camber and king pin inclination should not be checked on a new car until it is broken in.

CHECKING CASTER ANGLE

1. Make sure operations under "Inspection Before Alignment" have been performed.

2. Check caster angle using any reputable front end aligning equipment. Specifications for caster are $-1^\circ \pm 1/2^\circ$. When checking, it is necessary that readings be taken with car weight on the wheels, tires properly inflated, and vehicle level. Brakes must be held with a brake pedal depressor while checking caster.

3. Do not change camber adjustment, if outside limits, until caster has been set.

CHECKING CAMBER ANGLE

1. Make sure operations under "Inspection Before Alignment" have been performed.

2. Check camber angle using any reputable front end aligning equipment. Specifications for camber are $+\frac{1}{2}^\circ \pm\frac{1}{2}^\circ$. When checking, it is necessary that readings be taken with car weight on the wheels, tires properly inflated, and vehicle level.

3. Do not change camber adjustment, if outside limits, until caster has been set.

CHECKING KING PIN INCLINATION

If camber is correct or can be set to specifications, it is not necessary to check king pin inclination (KPI).

CHECKING TOE-IN

Check toe-in with a trammel, or with other reputable front end aligning equipment measuring from sidewall of tire or wheel felloes using methods given below.

For Measuring By Trammel

1. After moving car forward on level floor, chalk tread on both front tires at point 9" above floor.

2. With trammel set at center to center distance of front tires make mark in chalk on each front tire exactly trammel width apart.

3. Push car forward (never backward) until chalk with trammel marks is 9" above floor at rear of wheels.

4. Measure difference from trammel marks made when chalk was in front of wheel; if trammel marks are now greater than when marked at front, wheels toe-in by this amount (see specifications, page 3–19).

For Equipment Measuring From Sidewall Or Wheel Felloes

When using this type of equipment wheel run-out will have a very direct bearing on the readings. Since the allowable run-out is $\frac{1}{8}$" the readings could possibly be off as far as $\frac{1}{8}$" on each wheel if the effect of run-out is not cancelled. By taking the average of three readings with the wheel rotated 120° for each reading the error due to wheel run-out can be cancelled. This should be done as follows:

1. After moving the car forward on level floor take first reading.

2. Mark sidewall of both tires with the number "1" at rear of tire where instrument bears.

3. At 120° intervals (i.e. $\frac{1}{3}$ and $\frac{2}{3}$ distance around the tire) mark the numbers "2" and "3" on both tires.

4. Jack up and turn wheels until the number "2" is in the position which number "1" occupied when the first reading was taken.

5. Push car back one foot and bring forward to position and take second reading. This reading will then be taken with the instrument bearing 120° around the wheel from where the first reading was taken.

6. Use the same procedure for taking the third reading.

7. Average the three readings to find the actual toe-in.

CHECKING TOE-OUT ON TURNS

NOTE: Toe-out on turns should be checked only after any necessary corrections to camber, caster, and toe-in have been made.

1. Make sure operations under "Inspection Before Alignment" have been performed.

2. Check with any reputable front end aligning equipment using full floating turn tables. With front wheels resting on turn tables, turn wheels to left until left wheel has been turned 20° from straight ahead. The right wheel should then be turned 18° to 19°.

3. Turn wheels to right until right wheel has been turned 20° from straight ahead. Left wheel should now be turned 18° to 19°.

4. Incorrect steering geometry may be caused by other incorrect front end adjustments, but generally indicates bent steering arms which must be replaced followed by a complete front end check.

ADJUSTING FRONT END

ADJUST FRONT WHEEL BEARINGS

Two methods for adjusting front wheel bearings are given below. The first is the preferred method and should be used whenever possible.

Torque Wrench Method

1. Check to see that bearing cups are a press fit in hub and seated tight against shoulders.

2. Check to see that bearing cones have a slip fit on spindles, and bores of cones have a light coating of wheel bearing lubricant to allow creep.

3. Check fit of spindle nut on spindle threads. Nut MUST BE FREE RUNNING on threads; if not, remove all burrs from threads, keyslot, and cotter pin holes.

4. With wheel off ground adjust bearing as follows:

a. Tighten bearing adjusting nut with a torque wrench to approximately 200 lb. in. (17 lb. ft.) to insure that all parts are properly seated.

b. Back off nut and retighten to 45-50 lb. in. (Fig. 3-11).

c. If cotter pin hole in spindle and slot in nut line up, insert cotter pin. Otherwise, back off adjusting nut to nearest line-up of slot and hole and insert cotter pin. Cut off excess length of cotter pin to prevent interference with static brush in front wheel dust cap.

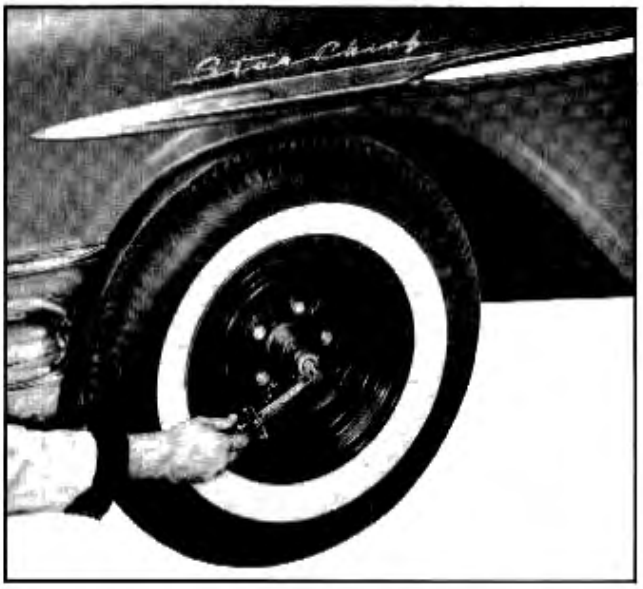


Fig. 3-11 Adjusting Wheel Bearing Using Torque Wrench

Hand Feel Method

1. Jack up wheel and remove dust cap.

2. Eliminate play of king pin by inserting wooden wedge between knuckle and king pin yoke on steering knuckle support.

3. Tighten bearing adjusting nut with an 8" to 10" wrench using only arm and shoulder strength and only enough to insure that parts are properly seated. Back off nut until first perceptible looseness is felt in bearing when tested by grasping tire at top and bottom and shaking. Tighten nut until a slot of nut lines up with one of the cotter pin holes in knuckle.

Fig. 3-12 Adjusting Caster or Camber

4. Insert new cotter pin and clinch, cutting off excess length to make sure ends of pin will not interfere with static brush in front wheel dust cap.

5. Remove wedge, replace dust cap and lower car.

SETTING CASTER

NOTE: Caster adjustment should always be made before camber adjustment. If camber was found to be within specifications, make complete turns of eccentric bushing when setting caster so as not to disturb camber setting. It is good practice, however, to check camber after setting caster.

1. Loosen eccentric bushing clamp bolt and turn bushing with Caster and Camber Adjusting Wrench J-5343 (Fig. 3-12) to give correct caster setting of $-1^{\circ} \pm \frac{1}{2}^{\circ}$ at each front wheel.

2. When correct caster setting has been obtained, tighten clamp bolt only enough to prevent setting from changing; proceed with camber adjustment or check, as required.

SETTING CAMBER

1. Loosen clamp bolt and rotate eccentric bushing using Wrench J-5343 (Fig. 3-12) to give correct camber setting of $+\frac{1}{2}'' \pm \frac{1}{2}''$ at each front wheel. It is never necessary to turn the eccentric bushing over $\frac{1}{2}$

turn to obtain the maximum possible adjustment of camber.

2. Tighten eccentric bushing clamp bolt to 30-45 lb. ft. torque.

SETTING TOE-IN

1. Remove horn button and set gear on high point of worm by turning steering wheel until mark on shaft is exactly at top. This mark locates the high point, or middle of gear travel.

2. Loosen tie rod end clamp bolts and turn tie rod tubes an equal amount until toe-in is 0-1/16" (see page 3–5, Checking Toe-in). Turn right tie rod in direction of rotation of wheels, when car moves forward, to increase toe-in; turn left tie rod in opposite direction to increase toe-in.

3. Check to see that front wheels are straight ahead by measuring from lower control arm inner shaft grease fitting to front of wheel rim on both sides. If measurement is not equal, turn both tie rod tubes in same direction (so as not to change toe-in) until measurements become equal. After making this adjustment it is very important to re-check toe-in since toe-in measurement is accurate only with wheels in straight ahead position.

4. Tighten tie rod end clamp nuts to 18-20 lb. ft. torque, making sure that tie rod end bearings are horizontal and slots in tie rod tubes are toward bolts in clamps.

MINOR REPAIRS

FRONT SHOCK ABSORBER—REMOVE AND REPLACE

1. Raise car on hoist, or jack up front end so weight of car is fully off front wheels.

2. Loosen and remove two nuts from bottom stud on shock absorber. NOTE: Shock absorber must not turn while loosening nuts. If necessary, use water pump pliers inserted through coils of front spring to hold shock absorber reservoir tube from turning (Fig. 3-13). Spring coils can be pried apart with large screw driver or similar tool to provide sufficient space to insert pliers.

3. Remove grommet retainer and grommet. Compress shock absorber as far as possible by pushing the lower section up. Tool J-5536 (Fig. 3-14) can be used for compressing shock absorber.

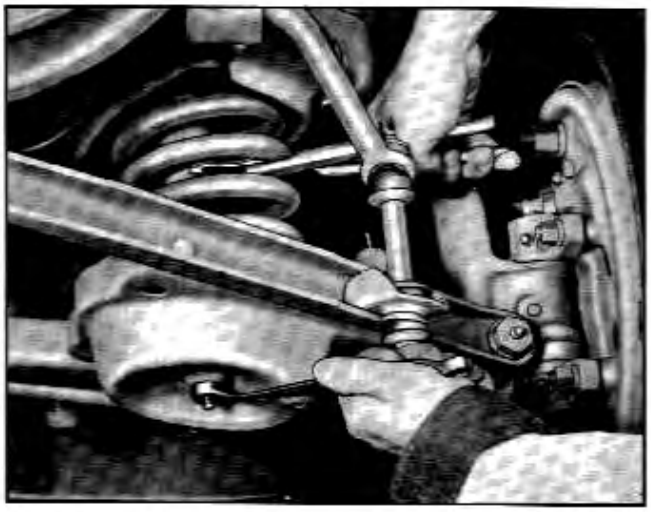


Fig. 3-13 Holding Shock Absorber to Loosen or Tighten Retaining Nuts

4. If car is on hoist, lower hoist until front wheel is at shoulder height.

5. Working over front wheel, remove two nuts holding front shock absorber upper bracket to frame.

6. Remove shock absorber with upper bracket upward out of coil spring and hole in frame. NOTE: On left side, removal will be simplified by first removing upper bracket from shock absorber.

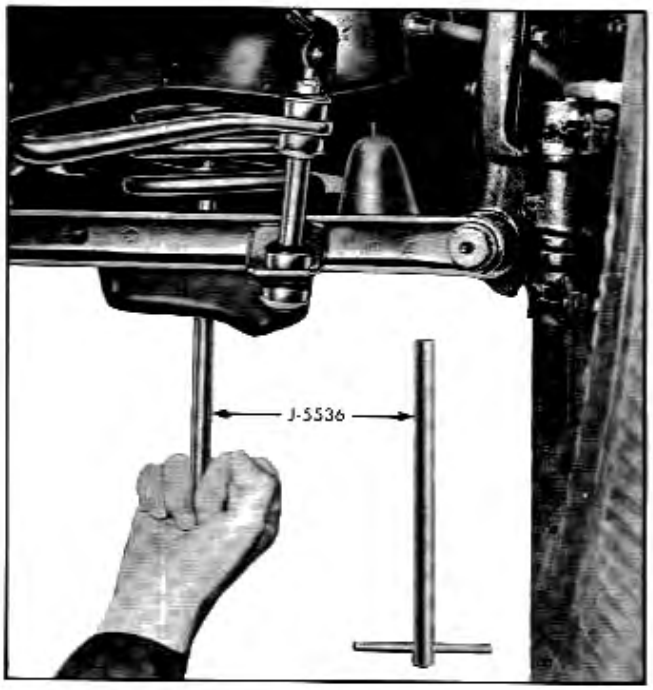


Fig. 3-14 Compressing Shock Absorber With Tool J-5536

7. Remove bracket and grommets from old shock absorber by removing two nuts on shock absorber upper stud, and install new shock absorber.

8. Install new shock absorber and bracket by reversing the procedure in Steps 1 through 6. Make sure all grommets and retainers are correctly installed (see Fig. 3-15 for details of mounting).

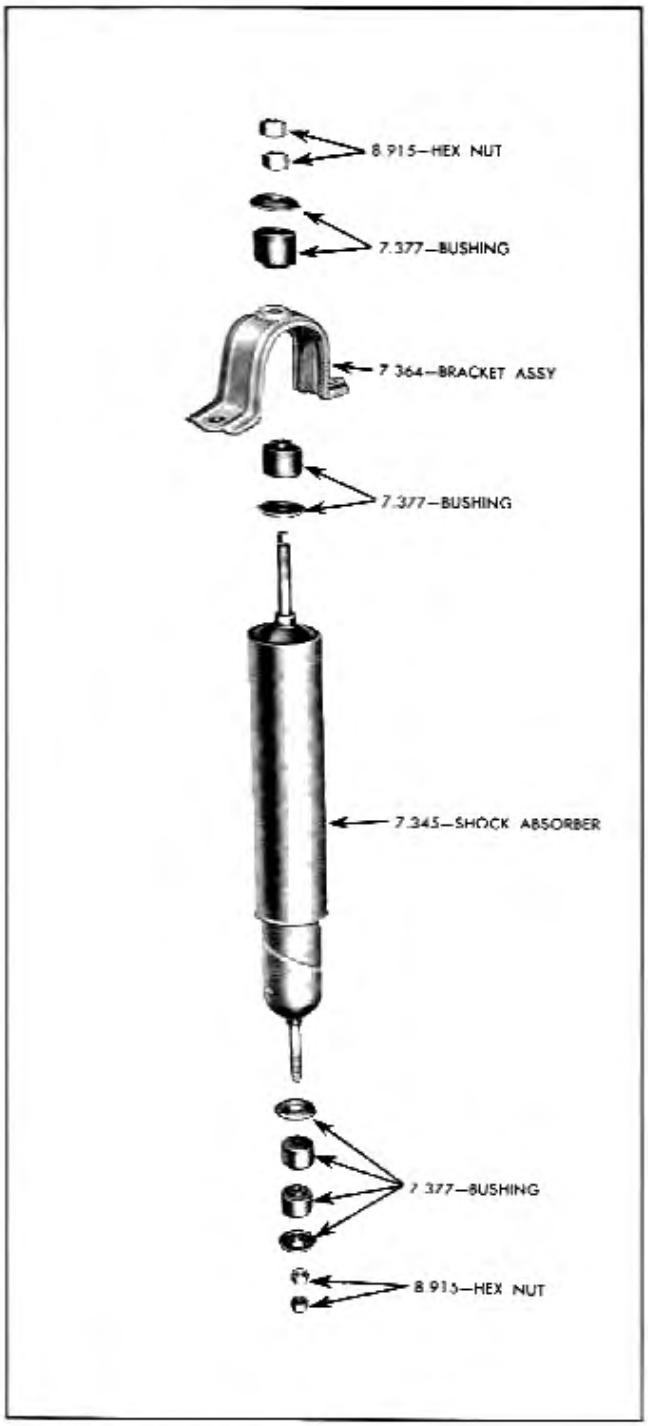


Fig. 3-15 Front Shock Absorber and Mounting Parts

UPPER PIVOT PIN AND ECCENTRIC BUSHING—REMOVE AND REPLACE

REMOVE

NOTE: A clearance of from .011" to .020" is provided between the threaded pins and bushings. The threaded surface automatically provides perfect side adjustment and where roll is always in the same direction, the two members forming the bearing are virtually tied together even when one fits loosely within the other. This permits ample space for lubrication, rolling action, and free action for oscillation. The rolling action minimizes wear and accounts for long life of the pin and bushing. If bushings are properly lubricated and clearances are within specification, they will not be noisy. UNDER NO CONDITIONS SHOULD ANY CHANGES BE MADE TO REDUCE SPECIFIED THREAD CLEARANCE GIVEN ABOVE.

1. Place a jack under lower control arm, raise wheel off floor, and remove wheel.

2. Remove nut from front end of right hand upper pivot pin (Fig. 3-16) or from rear of left hand pin.

3. Remove threaded pivot pin. NOTE: To prevent damage to brake hose, fasten knuckle support to frame upper rubber bumper.

4. Loosen clamp bolt and remove eccentric bushing from knuckle support.

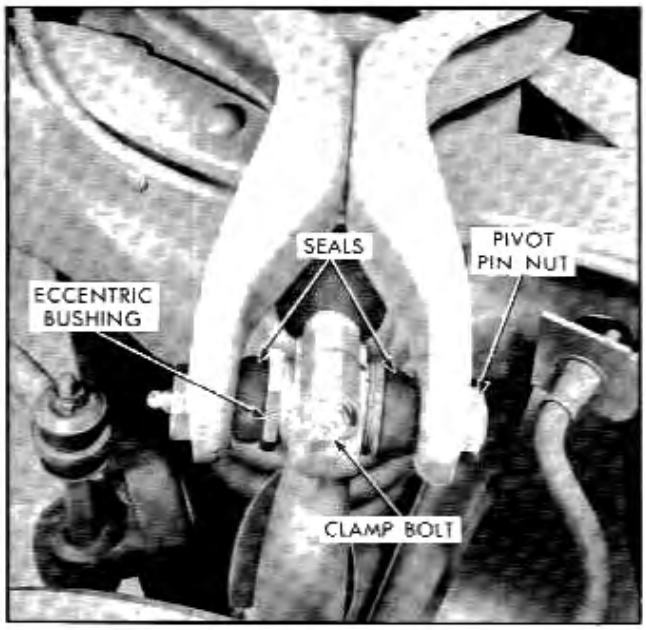


Fig. 3-16 Upper Pivot Pin Assembly

REPLACE

1. Position seals over ends of upper control arms as shown in Fig. 3-17.

2. Install new eccentric bushing in knuckle support so it is centralized (projects same amount both ends).

3. Position knuckle support with bushing in forked end of upper control arm. Coat threads of pivot pin with chassis lubricant and install pin and lockwasher in control arm and knuckle support. See that pivot pin bolt head (with lockwasher) is turned up tightly against surface of control arm (60-80 lbs. ft. torque).

NOTE: Install upper pivot pin from front side on left hand suspension and from rear side on right hand suspension. Lubricating fittings will be towards front for left hand suspension and rear for right hand suspension (Fig. 3-1).

4. Install pivot pin nut and lockwasher and tighten nut securely against surface of control arm (60-80 lb. ft. torque). NOTE: Make visual inspection to see that bolt head and nut are turned up securely against metal of control arm to insure firm seating. If not, apply additional torque to seat parts properly.

5. Stretch rubber seals over end of control arm into position over threads of pin as shown in Fig. 3-16.

6. Lubricate pivot pin, install front wheel, lower car, and check front wheel alignment

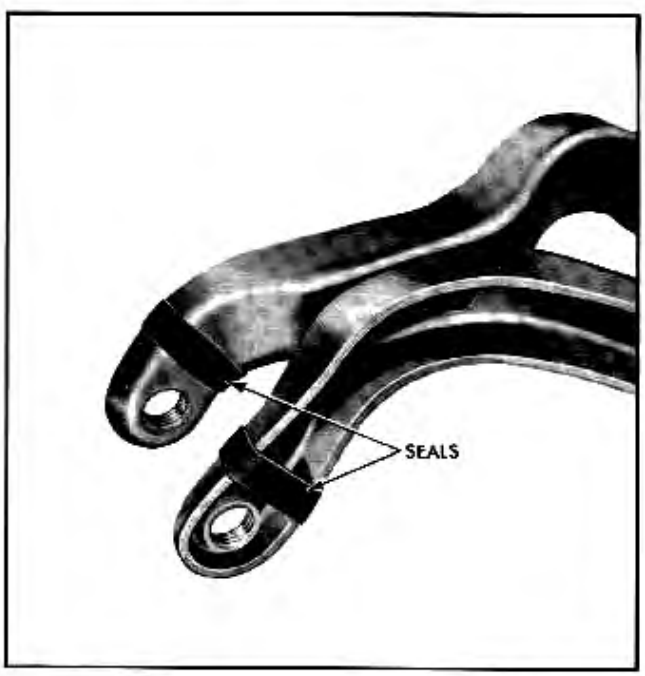


Fig. 3-17 Seals Positioned for Assembly of Pivot Pin

LOWER PIVOT PIN AND BUSHING— REMOVE AND REPLACE

NOTE: It will be noted that in some of the Front Suspension Minor Repair operations involving control arm bushings, torque tightness specifications in excess of the usually available torque wrenches are given (250-455 lb. ft.). It is not intended that parts having such high torque specifications be tightened with a torque wrench; these torque specifications are those used in production and are listed to give the mechanic an idea of the approximate force required to insure secure seating of front suspension parts. In all cases involving tightening of front suspension control arm bushings, pivot pins and nuts, a visual inspection of the assembly must be made after tightening to see that a positive metal to metal seating has resulted between the bushing shoulder, pivot pin head, or nut and the metal of the control arm or steering knuckle support.

1. Place jack under lower control arm, raise wheel off floor and remove wheel and brake drum assembly.

2. If knuckle support lower bushing is to be replaced, remove brake support assembly from knuckle.

NOTE: This operation is only necessary when knuckle support lower bushing is to be removed. Omit this step if lower pivot pin only is to be removed.

3. Remove nut from rear of left hand lower pivot pin or front of right hand pin (Fig. 3-18).

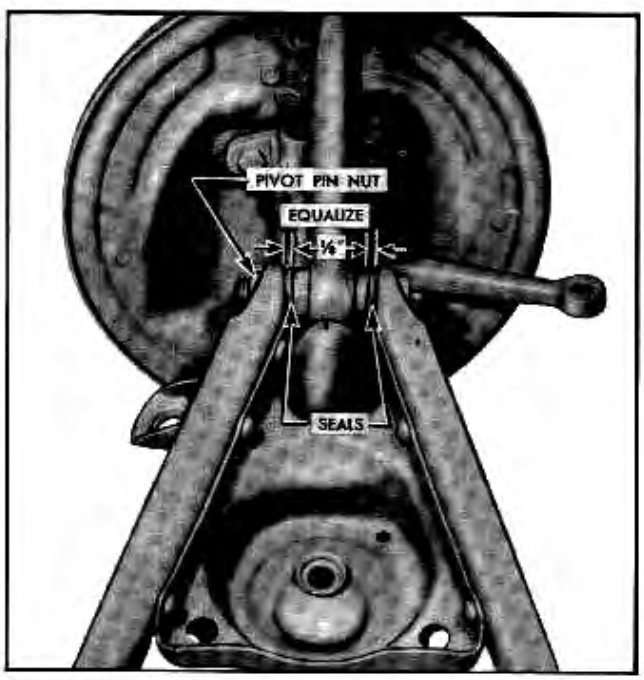


Fig. 3-18 Lower Pivot Pin Assembly

4. Remove lower pivot pin.

5. If knuckle support lower bushing is to be replaced, remove upper pivot pin. NOTE: This operation is only necessary when knuckle support lower bushing is to be removed. Omit this step if lower pivot pin only is to be removed.

6. Clamp knuckle support in vise, remove knuckle support lower bushing and install new bushing. Bushing must be very firmly tightened in knuckle support so there is no clearance between the bushing shoulder and knuckle support (250 lb. ft. torque).

7. If upper pivot pin was removed in Step 5, place knuckle support in position and install upper pivot pin (see page 3-8).

8. Position rubber seals at lower pivot pin bushing (Fig. 3-18). Hold bushing with knuckle support in a central position in forked end of lower control arm and install lower pivot pin and lockwasher after coating threads on pin with chassis lubricant. NOTE: Lower pivot pin must be centered, within one thread, between ends of control arm after lock nut has been tightened (Fig. 3-18).

NOTE: Install lower pivot pin from front side of left hand suspension and from rear side on right hand suspension. Lubricating fittings will be toward front for left hand suspension and rear for right hand suspension (Fig. 3-1).

9. With hex head of pivot pin firmly tightened against control arm (60 to 80 lb. ft. torque), install pivot pin nut and lockwasher and tighten until securely seated against control arm (60 to 80 lb. ft. torque).

10. Reinstall brake support assembly (if removed in Step 2). Install wheel and brake drum.

11. Lubricate pivot pins, lower car, and check wheel alignment.

FRONT SPRING—REMOVE AND REPLACE

Front spring replacement requires use of a chain hoist and car stand. If a chain hoist is not available the operation can be performed by using three car stands and a GOOD hydraulic floor jack. CAUTION: *Do not attempt to use floor jack method unless a good hydraulic jack with positive control over lowering a load SLOWLY is available.*

CHAIN HOIST METHOD

1. Lift car with chain hoist so wheels are 8″ off floor and place car stand under inner side of lower control arm spring pad from which coil spring is to be removed. Lower car until it touches top of car stand. Remove wheel.

2. Remove shock absorber (page 3–7).

3. Disconnect lower end of stabilizer link at lower control arm.

4. Remove lower pivot pin nut and pin from bushing.

5. Raise the car slowly with chain hoist and remove coil spring.

6. When installing spring, have car elevated on chain hoist and place bottom of spring in seat on lower control arm. Top of spring may be identified since it is flat and bottom is not. End of coil at bottom of spring must index with hole provided in spring seat in lower control arm.

7. Lower chain hoist gradually, checking to see that spring is correctly seated top and bottom.

8. Install lower pivot pin and nut (see page 3–9) and connect stabilizer link.

9. Install shock absorber (page 3–7).

10. Lubricate pivot pin, install front wheel, lower car and check wheel alignment. NOTE: Wheel alignment must be checked since replacement of front springs will usually affect jounce space and, therefore, wheel alignment.

FLOOR JACK METHOD

1. Raise front end of car with jack until wheels are about 10″ above floor and place car stand under frame side member on each side of car forward of front door hinge pillar so car will be firmly supported.

2. Place car stand under lower control arm of spring which is not to be replaced. The two stands under the frame are almost at car center of balance so car will asume a horizontal position on the two stands when jack is removed unless the extra stand is placed under control arm to keep car front end elevated.

3. Place floor jack under lower control arm spring seat from which spring is to be removed and raise jack until it touches spring seat.

4. Remove wheel on side of car where spring is to be removed.

5. Remove shock absorber (page 3–7).

6. Disconnect lower end of stabilizer link at lower control arm.

7. Remove lower pivot pin nut and pin from bushing.

8. Slowly lower jack until coil spring is fully extended and remove spring.

9. To install spring have jack pad under spring seat and place spring in seat on lower control arm with end of coil at bottom of spring indexing with hole in spring seat. Top of spring may be easily identified since it is flat and bottom of spring is not.

10. Raise jack gradually, checking to see that spring is correctly seated top and bottom.

11. Install lower pivot pin and nut (page 3–9) and connect stabilizer bar to lower control arm.

12. Install shock absorber (page 3–7).

13. Lubricate pivot pin, install front wheel, lower car and check wheel alignment. NOTE: Wheel alignment must be checked since replacement of front springs will usually affect jounce space and, therefore, wheel alignment.

LOWER CONTROL ARM AND SHAFT— REMOVE AND REPLACE

NOTE: See Note under heading "Lower Pivot Pin and Bushing—Remove and Replace".

1. Follow procedure for removing front spring as outlined on page 3–10.

2. Remove four nuts and lockwashers holding lower control arm shaft to frame cross member and remove control arm and shaft assembly.

3. Remove shaft from control arm by removing front and rear threaded bushings from shaft and control arm.

4. When installing a new lower control arm, it is necessary to cut a thread for the bushing in extruded portion of arm. The shaft bushing has threads on inside and outside so that as the bushing threads onto the pivot shaft, the outside thread on bushing cuts its own thread in lower control arm. To install pivot shaft in new arm proceed as follows:

a. Place tool J-1052 in position and expand until distance between inner faces of arms is 11½" (Fig. 3-19 and 3-20).

b. Place pivot shaft with rubber seals in position in control arm.

c. Lubricate pivot shaft threads with a 25% flake graphite lubricant, then start bushing on pivot shaft and into arm at the same time. Tighten until bushing flange is firmly seated against metal of control arm (385-455 lb. ft. torque).

d. Center pivot shaft in control arm and install other bushing being sure threads index so there is no bind. Tighten until bushing flange is firmly seated against metal of control arm (385-455 lb. ft. torque) Remove special tool J-1052.

e. Check to see that distance between inner faces of shaft ends of control arm is 11½" plus or minus 3/32". Also check to see that distances from center of pivot shaft bolt holes to inside faces of arm are equal at each end (Fig. 3-20). Turn pivot shaft in arm to centralize if distance is not equal.

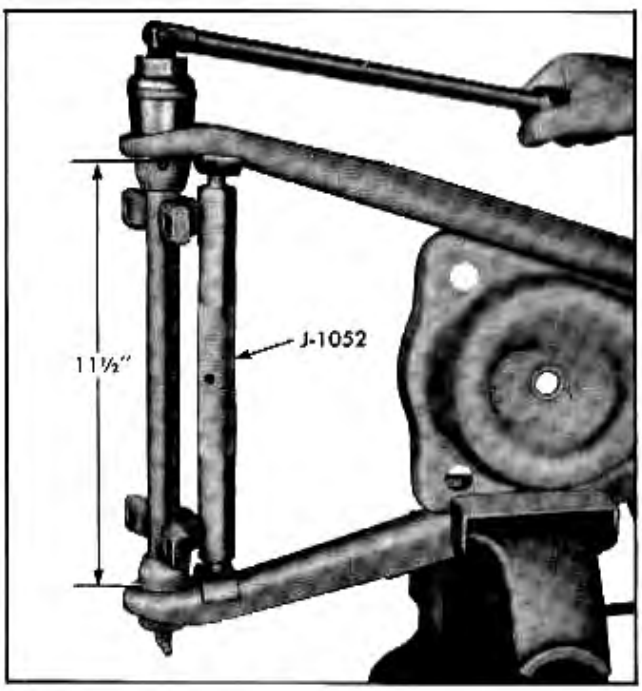


Fig. 3-19 Lower Control Arm Spreader J-1052 Positioned in Lower Control Arm

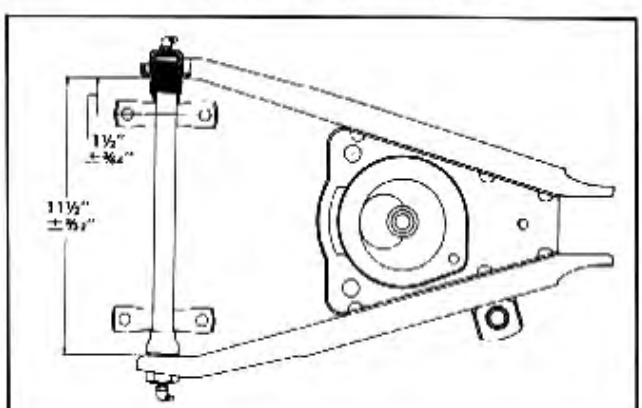


Fig. 3-20 Correct Installation of Shaft in Lower Control Arm

5. Position lower control arm and shaft on frame cross member and install retaining nuts and lockwashers. Tighten nuts to 70-85 lb. ft. torque.

6. Complete installation by following procedure for installing spring as outlined on page 3–10.

7. Lower car, lubricate control arm shaft and lower pivot pin, and check front wheel alignment.

UPPER CONTROL ARM AND SHAFT— REMOVE AND REPLACE

NOTE: See "Note" under heading "Lower Pivot Pin and Bushing—Remove and Replace".

1. Place jack under lower control arm, raise wheel off floor and remove wheel.

2. Remove upper pivot pin following procedure on page 3–8.

3. Remove two bolts and self-locking nuts holding upper control arm shaft to frame and remove arm and shaft assembly. (Nuts can be reached through access holes in bottom of front cross member.)

4. Remove shaft from control arm by removing front and rear threaded bushings.

5. Install pivot shaft in new arm as follows (the procedure is very similar to that used for lower control arm).

a. Place tool J-5324 in position and expand until distance between inner faces of arms is 6 9/16" (Fig. 3-21).

b. Place pivot shaft with new rubber seals in position in control arm.

c. After lubricating pivot shaft threads with chassis lubricant, start bushing on pivot shaft and into arm at same time. Tighten so bushing flange is firmly seated against control arm (326-380 lb. ft. torque).

d. Center pivot shaft in control arm and install other bushing being sure threads index so there is no bind. Tighten so bushing flange is firmly seated against control arm (326-380 lb. ft. torque). Remove special spreader tool.

e. Check to see that distance between inner faces of shaft ends of control arm is correct (Fig. 3-22). Also check to see that pivot shaft is equalized in arm by measuring from bolt hole to arm at each end of shaft. Turn shaft in arm to centralize if distances from each bolt hole to arm are not equal. NOTE: Frictional drag of shaft in bushings should not exceed 12 lb. in.

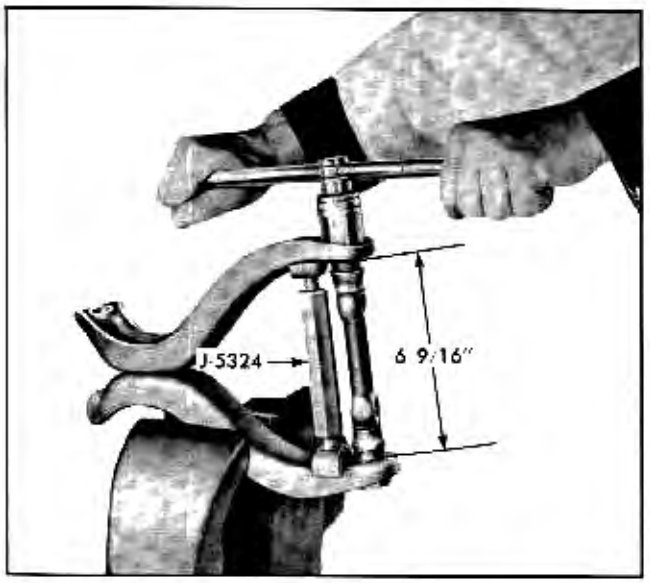


Fig. 3-21 Upper Control Arm Spreader J-5324 Positioned in Upper Control Arm

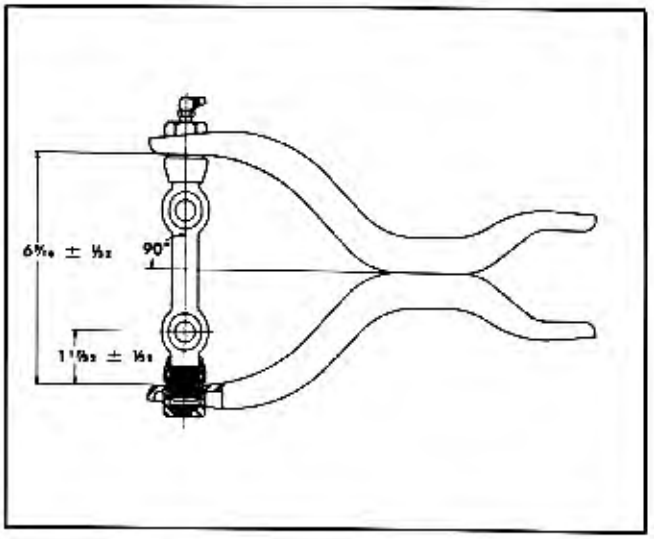


Fig. 3-22 Correct Installation of Shaft in Upper Control Arm

6. Position upper control arm and shaft on frame cross member and install two bolts and self-locking nuts. Tighten nuts to 80-95 lb. ft. torque. NOTE: Nuts must be installed and tightened by means of an extension inserted through access holes in front cross member.

7. Complete installation by following procedure for installing upper pivot pin (page 3-8).

8. Lubricate control arm shaft and upper pivot pin, replace wheel, lower car, and check front wheel alignment.

KING PIN AND BUSHINGS—REMOVE AND REPLACE

REMOVE

1. Jack up wheel under lower control arm and remove wheel and brake drum assembly.

2. Remove support assembly without disconnecting brake hose. Place support assembly out of way so as to avoid any strain on brake hose.

3. Remove king pin lock pin (Fig. 3-2).

4. Remove lower expansion plug under king pin by driving punch through upper expansion plug. If necessary, king pin can be driven up to remove upper expansion plug.

5. Drive out king pin.

6. Press out bushings using Bushing Remover and Replacer J-6327 (Fig. 3-23).

REPLACE

1. Use Welch Plug Reamer J-6330 (Fig. 3-24) for cleaning up recesses in steering knuckle where metal was upset over expansion plug.

2. Align lubrication hole in bushing with similar hole in steering knuckle. Press new bushing into place using opposite end of Bushing Remover and Replacer J-6327 (Fig. 3-25).

3. Line ream bushings to size with Reamer J-6328 (Fig. 3-26).

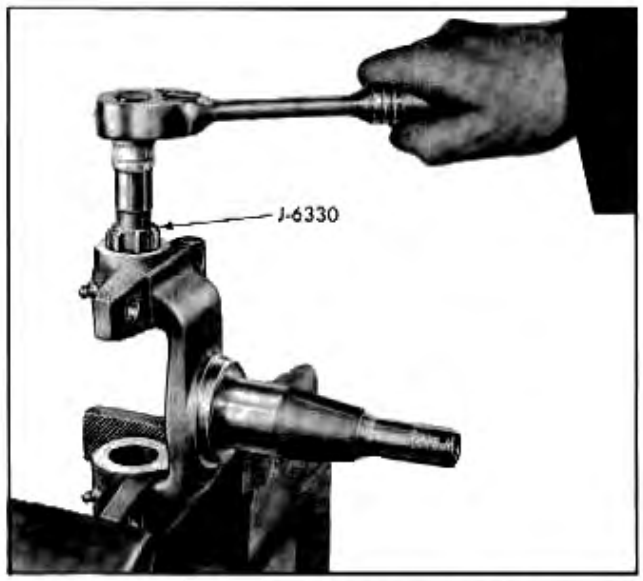


Fig. 3-24 Reaming Steering Knuckle with Reamer J-6330

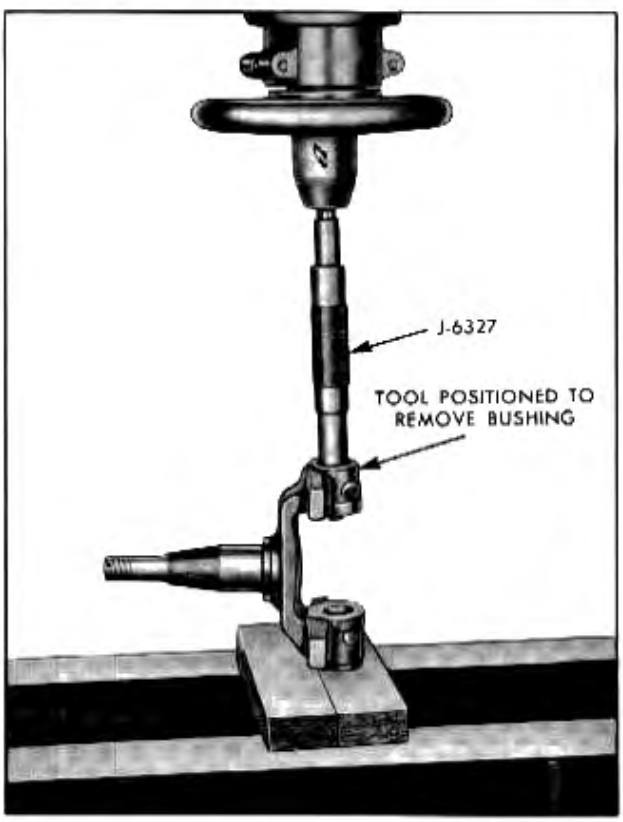


Fig. 3-23 Removing Steering Knuckle Bushing

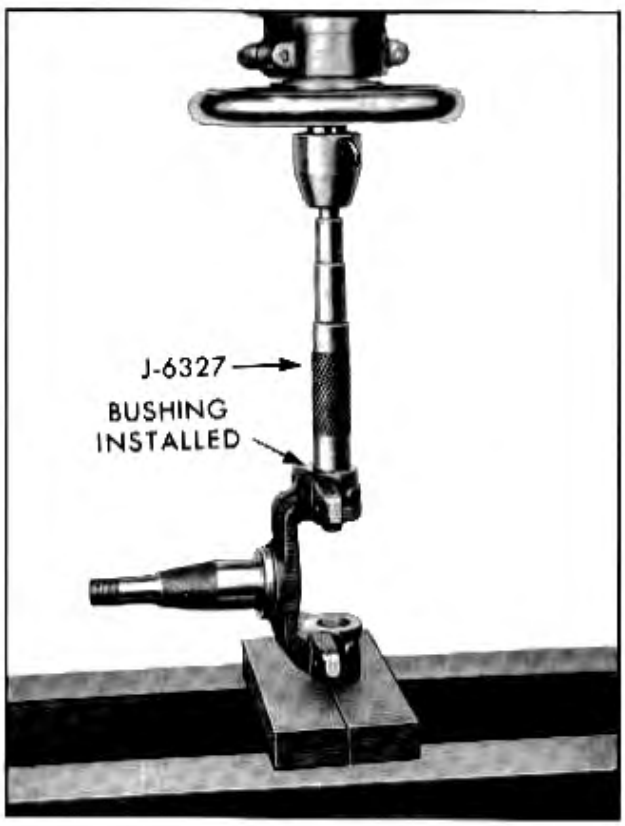


Fig. 3-25 Installing Steering Knuckle Bushing

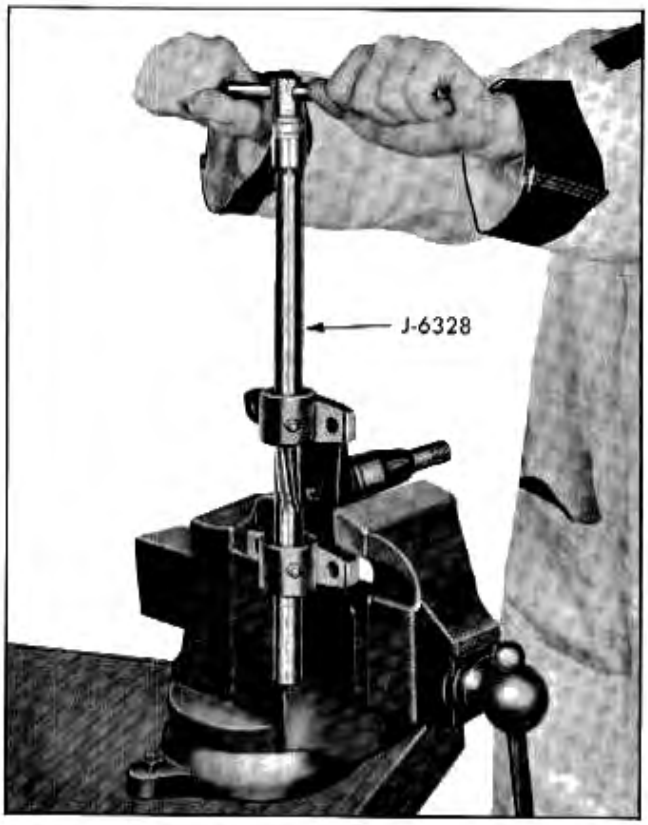


Fig. 3-26 Reaming Steering Knuckle Bushing

4. Install "O" ring seal next to upper steering knuckle bushing in space provided. With "O" ring seal in place position steering knuckle on top of steering knuckle support and install thrust bearing (Fig. 3-2). With steering knuckle and thrust bearing in alignment with steering knuckle support, install king pin part way through thrust bearing. Check knuckle end play and if over .005" install necessary thrust bearing shims to reduce end play to .005" or less. Drive king pin in position for locking. Check to see that knuckle turns freely.

5. Drive in king pin lock pin.

6. Install expansion plugs on both ends of king pin, staking them securely in place in steering knuckle. NOTE: Plugs must be staked securely so that lubricant will be retained in king pin bushings.

7. Install brake support assembly. (Tighten nuts to 50-70 lb. ft. torque.)

8. Install wheel and drum assembly and lower car.

9. Lubricate king pin being certain that lubricant does not leak past expansion plug. Stake plugs more securely if necessary to prevent leakage.

FRONT STABILIZER—REMOVE AND REPLACE

1. Disconnect both links from stabilizer bar by removing nuts from top of link and pulling downward from bracket on lower control arm.

2. Remove bolts holding two stabilizer bar brackets to frame and remove stabilizer bar.

3. Install stabilizer bar on frame by placing two brackets over rubber insulators on bar and install mounting bolts to frame and tighten to 10 to 20 lb. ft. torque. When properly installed the central portion of the bar will be downward and toward the rear of car.

4. Place rubber grommet above and below lower control arm bracket and above and below eye of bar with front stabilizer link spacer in between and insert link from below.

5. Install nut on each link, drawing it down as far as possible. Lock with lock nut.

TROUBLE DIAGNOSIS AND TESTING

HARD STEERING

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Steering gear or connections adjusted too tight.	2. Test steering system for binding with front wheels off floor. Adjust as necessary and lubricate.
3. Insufficient or incorrect lubricant used.	3. Check lubricant in steering gear and lubricate steering system as required.
4. Excessive caster.	4. Check caster and adjust as necessary.

HARD STEERING (cont.)

CAUSE	REMEDY
5. Suspension arms bent or twisted.	5. Check wheel alignment by testing camber and caster. If arms are out of car, check against new arms. Replace arms if bent.
6. Front spring sagged.	6. Check front end jounce space (Fig. 3-9). Dimensions should be approximately the same on both sides. Compare dimensions with those on car having about same mileage and equipment and believed to be standard. Replace front springs if sagged.
7. Frame bent or broken.	7. Repair or replace frame as necessary.
8. Steering knuckle bent.	8. Replace with new knuckle.
9. King pin galled or frozen in bushing.	9. Replace pin and bushings.

EXCESSIVE PLAY OR LOOSENESS IN STEERING

CAUSE	REMEDY
1. Steering gear or connections adjusted too loose or worn.	1. Adjust or install new parts as necessary.
2. Steering knuckle bushings worn.	2. Install new bushings.
3. Front wheel bearings incorrectly adjusted or worn.	3. Adjust bearings or replace with new parts as necessary.

ERRATIC STEERING ON APPLICATION OF BRAKES

CAUSE	REMEDY
1. Oil or brake fluid on brake lining.	1. Replace lining and correct leak.
2. Brakes incorrectly or unevenly adjusted.	2. Adjust brakes.
3. Front springs weak.	3. Replace with new springs.
4. Low or uneven tire pressure.	4. Inflate tires to proper pressure.
5. Insufficient or uneven caster.	5. Check and adjust caster as necessary.
6. Steering knuckle bent.	6. Replace knuckle.

CAR PULLS TO ONE SIDE

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Incorrect or uneven caster or camber.	2. Check caster and camber and correct by adjustment or replacing parts.
3. Wheel bearings adjusted too tight.	3. Adjust wheel bearings.

CAR PULLS TO ONE SIDE (cont.)

CAUSE	REMEDY
4. Front springs sagged.	4. Check as outlined under Hard Steering (page 3–15, Step 6). Sagged springs should be replaced.
5. Toe-in incorrect.	5. Adjust tie rods to make front wheels toe-in proper amount.
6. Oil or brake fluid on brake lining.	6. Replace linings and correct leak.
7. Brakes incorrectly or unevenly adjusted.	7. Adjust brakes.
8. Steering knuckle or knuckle support bent.	8. Replace with new parts.
9. Frame bent or broken.	9. Check frame for proper alignment and breakage. Repair or replace frame as necessary.
10. Shock absorbers inoperative.	10. Check and replace shock absorbers if necessary.
11. Rear wheels not tracking with front wheels.	11. Check alignment of rear wheels with front wheels and correct as necessary. Check alignment of frame.
12. Rear axle shifted (spring U bolts loose or center bolt sheared).	12. Check spring U bolts for looseness. Measure from rear spring front bolt to axle housing. This distance should be equal on both sides of car.

SCUFFED TIRES

CAUSE	REMEDY
1. Tire improperly inflated.	1. Inflate tire to recommended pressure.
2. Toe-in incorrect.	2. Adjust tie rods to make front wheels toe-in proper amount.
3. Excessive wheel or tire runout.	3. Check for wheel and tire wobble. See that wheels and tires are properly mounted.
4. Steering knuckle bushings worn.	4. Install new bushings.
5. Uneven camber.	5. Check camber and adjust as necessary.
6. Incorrect toe-out on turns.	6. Replace steering knuckle arms with new ones.
7. Suspension arms bent or twisted.	7. Check camber, king pin inclination and caster. Replace arms with new ones if bent.
8. Steering knuckle bent.	8. Replace with new knuckle.
9. Excessive speed on turns.	9. Caution driver.

CUPPED TIRES

CAUSE	REMEDY
1. Improper toe-in.	1. Check toe-in with trammel and adjust.
2. Tires improperly inflated.	2. Inflate tires to recommended pressure.
3. Worn steering knuckle bushings or wheel bearings incorrectly adjusted or worn.	3. Adjust or replace parts as necessary.

CUPPED TIRES (cont.)

CAUSE	REMEDY
4. Uneven camber.	4. Check camber and adjust as necessary.
5. Steering knuckle bent.	5. Replace with new knuckle.
6. Excessive mileage without rotating tires.	6. Rotate tires every 4000 miles.

FRONT WHEEL SHIMMY

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Wheels, tires or brake drums out of balance.	2. Balance wheels and tires. Also check for out-of-balance brake drums and for eccentric or bulged tires and replace as necessary.
3. Excessive wheel or tire runout.	3. Check for wheel and tire wobble and radial run-out. See that wheels and tires are properly mounted.
4. Shock absorbers inoperative.	4. Check and replace if necessary.
5. Steering connections incorrectly adjusted or worn.	5. Adjust or install new parts as necessary.
6. Steering gear incorrectly adjusted.	6. Adjust steering gear.
7. Front wheel bearings incorrectly adjusted or worn.	7. Adjust bearings or replace with new parts as necessary.
8. Incorrect or uneven caster.	8. Check caster and adjust as necessary.
9. Steering knuckle bushings worn.	9. Install new bushings.
10. Toe-in incorrect.	10. Adjust tie rods to make front wheels toe-in proper amount.
11. Steering knuckle bent.	11. Replace with new knuckle.
12. Eccentric or bulged tires.	12. Replace with new tires.
13. Stabilizer inoperative.	13. Inspect bushings and links, replacing worn parts.

FRONT WHEEL TRAMP

CAUSE	REMEDY
1. Wheels, tires or brake drums out of balance.	1. Balance wheels and tires. Also check for out-of-balance brake drums and for eccentric or bulged tires and replace as necessary.
2. Wheel or tire not concentric.	2. Replace wheel or tire.
3. Shock absorbers inoperative.	3. Replace shock absorbers.
4. Stabilizer inoperative.	4. Inspect bushings and links replacing worn parts.

CAR WANDERS

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Steering gear or connections adjusted too loose or worn.	2. Adjust or install new parts as necessary.
3. Steering gear or connections adjusted too tight.	3. Test steering system for binding with front wheels off floor. Adjust as necessary and lubricate.
4. Steering knuckle bushings worn.	4. Install new bushings.
5. Improper toe-in.	5. Adjust tie rods to make front wheels toe-in proper amount.
6. Incorrect or uneven caster or camber.	6. Check caster and camber and adjust as necessary.
7. Steering knuckle bent.	7. Replace with new knuckle.
8. King pin bent.	8. Replace with new pin. Drive lock pin in securely but not excessively.
9. Rear axle shifted. (Spring U bolts loose or center bolt sheared.)	9. Check spring U bolts for looseness. Also measure from rear spring front bolt to housing. This distance should be equal on both sides of car.
10. Stabilizer inoperative.	10. Inspect bushings and links, replacing worn parts.
11. King pins or bushings tight.	11. Replace as necessary.
12. Bind in lower or upper control arm shaft.	12. Free up or replace parts.
13. Bind in rear spring shackles or dry rear springs.	13. Replace shackle bushing and lubricate springs.
14. Excessive backlash in steering gear.	14. Adjust steering gear.

ROAD SHOCKS

CAUSE	REMEDY
1. High air pressure in tires.	1. Bleed to recommended pressure. CAUTION: *Do not "bleed" tires when warm.*
2. Steering gear or connections incorrectly adjusted	2. Adjust steering gear and connections.
3. Excessive caster.	3. Check caster and adjust as necessary.
4. Shock absorbers inoperative.	4. Replace shock absorbers.
5. Front springs weak or sagged.	5. Check as outlined under Hard Steering (page 3–15, Step 6). Replace weak or sagged springs.
6. Wrong type or size of tires used.	6. Install new tires of correct type and size.
7. Steering knuckle bent.	7. Replace with new knuckle.

SPECIFICATIONS

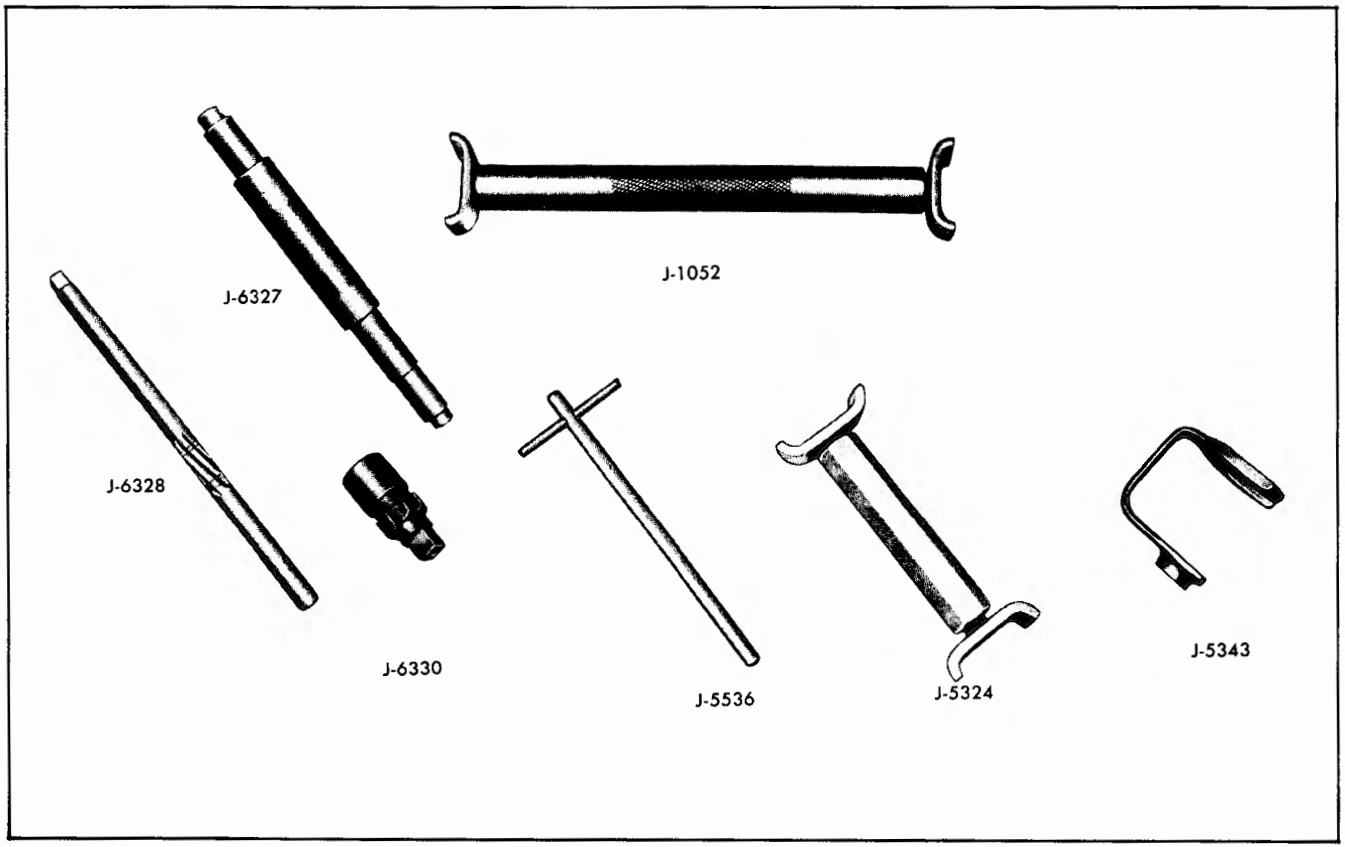
Alignment (curb weight)	
Caster angle	$-1^\circ \pm \frac{1}{2}^\circ$
Camber angle	$+\frac{1}{2}^\circ \pm \frac{1}{2}^\circ$
Toe-in	0″ to 1/16″ with trammel 9″ above floor
Shock absorber	
Collapsed length (ends of studs)	Approx. 13″
Extended length (ends of studs)	Approx. 17 15/16″
Pivot pin to bushing clearance (upper and lower)	.011″-.020″
Steering knuckle end play (on support)	.005″ max.

Toe-out..... Right wheel turned 20° from straight ahead position, left wheel should be turned 18° to 19°.

TORQUE SPECIFICATIONS

	Lb. Ft. Torque
Upper Control Arm Inner Shaft to Frame Bolts	80-95
Lower Control Arm Inner Shaft to Frame Nuts	70-85
Eccentric Bushing Clamp Bolt	30-45
Tie Rod Clamp Nuts	18-20
Knuckle Support Pivot Pin— Upper and Lower	60-80
Knuckle Support Pivot Pin Nut— Upper and Lower	60-80
Brake Support Assembly to Steering Knuckle Nuts	50-70
Steering Knuckle Support Lower Bushing	250-260*
Lower Control Arm Inner Shaft Bushing	385-455*
Upper Control Arm Inner Shaft Bushing	326-380*

*Torque values marked with an asterisk are values used in production and are for reference only. These parts must be tightened with sufficient torque to secure firm metal-to-metal seating of the parts in question as instructed in the text.



SPECIAL TOOLS—FRONT SUSPENSION

J-1052	Lower Control Arm Spreader
J-6330	Steering Knuckle Expansion Plug Hole Reamer
J-5324	Upper Control Arm Spreader
J-5343	Caster and Camber Adjusting Wrench
J-5536	Shock Absorber Remover and Replacer
J-6327	Steering Knuckle Bushing Remover and Replacer
J-6328	Steering Knuckle Bushing Reamer