SECTION 6-D
PROPELLER SHAFT

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6-12 DESCRIPTION OF PROPELLER SHAFT

The propeller shaft assembly consists of a front propeller shaft, a rear propeller shaft, a standard universal joint at each end, and a double constant velocity type universal joint in the center. See Figure 6-41. A center support bearing attaches the rear end of the front propeller shaft to the frame tunnel. A splined front yoke on the front end of the rear propeller shaft extends into a splined coupling in the rear end of the front propeller shaft. This slip spline permits the slight lengthening and shortening of the propeller shaft required by the up and down movement of the rear axle assembly. See Figure 6-42.

The constant velocity universal joint is composed of two single joints connected with a special link yoke. A center ball and socket between the joints maintains the relative position of the two units. See Figure 6-41. This center ball causes each of the two joints to operate through exactly one half of the complete angle between the front and rear propeller shaft. Because the two joint angles are the same, even though the usual universal joint fluctuation is present within the unit, the acceleration of the front joint is always neutralized by the deceleration of the rear joint, or vice versa. The end result is, the front and rear propeller shafts always turn at a constant velocity.

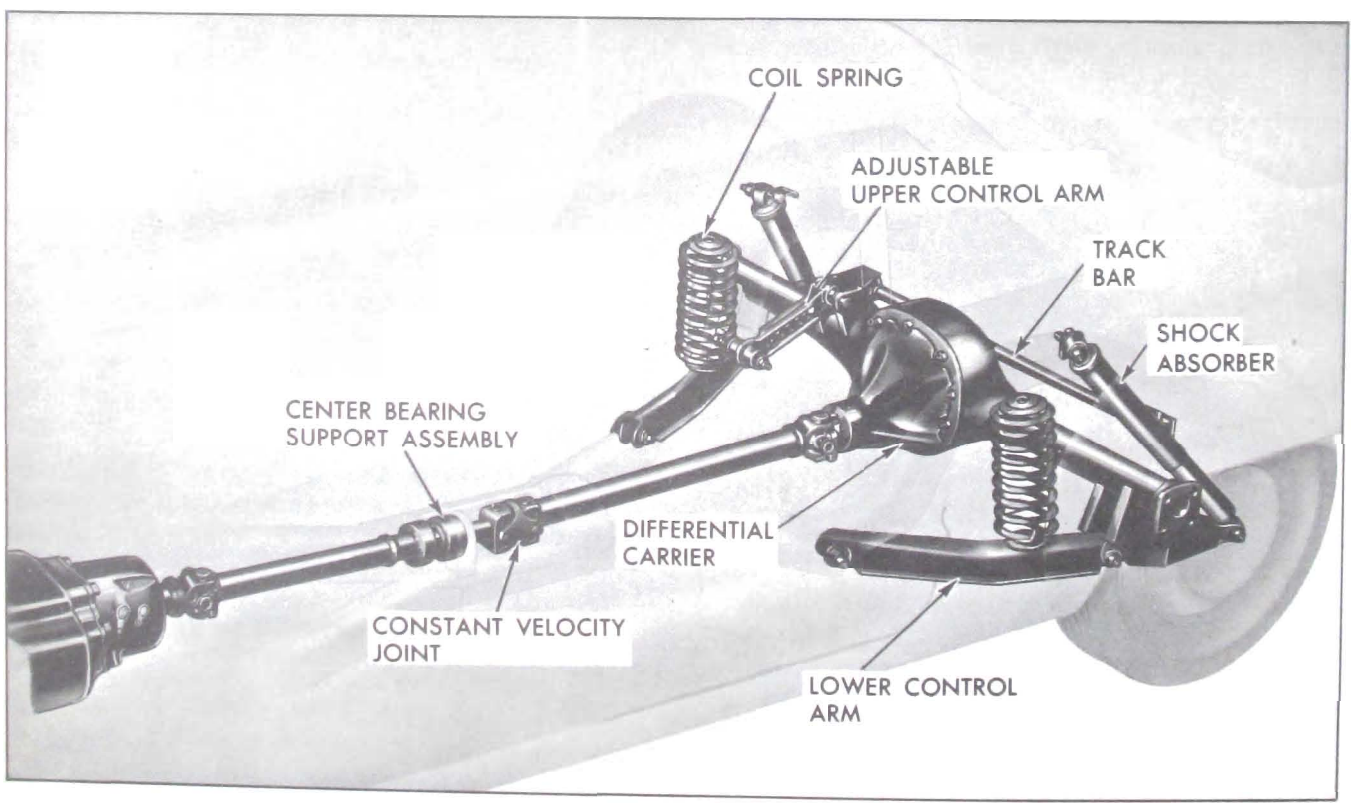

Figure 6-41—Propeller Shaft and Rear Axle Assemblies

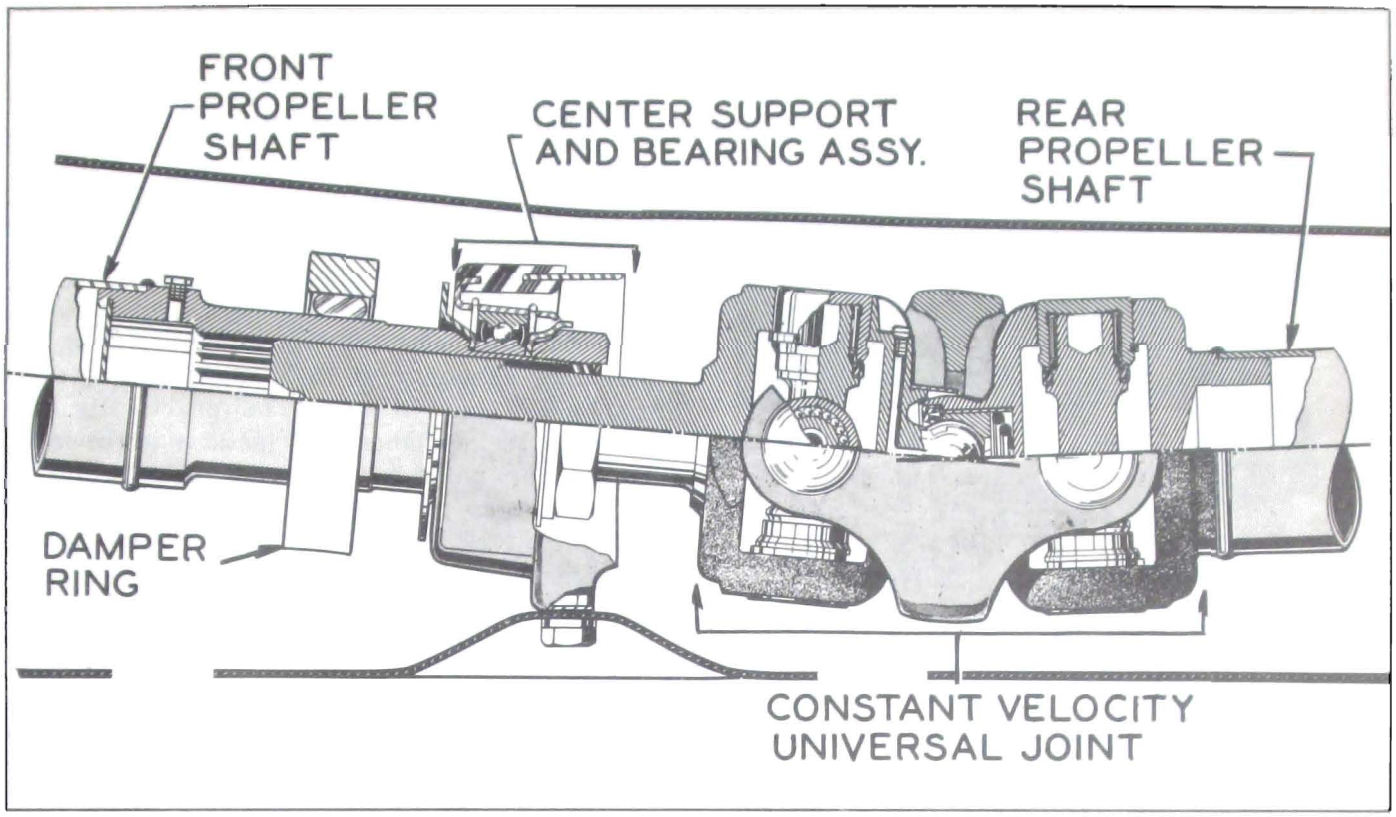

Figure 6-42—Center Support, Bearing, and Constant Velocity Joint

The center support bearing consists of a sealed bearing, the inner race of which is held against a shoulder at the rear end of the front propeller shaft by a lock nut. The center bearing outer race sets in a metal retainer which has a rubber support cushion bonded to it. The rubber cushion in turn is bonded to a support bracket which is bolted to the frame tunnel. The lock nut which retains the center bearing in place also prevents the slip joint from separating. The seal which retains the lubricant in the slip spline is located inside the lock nut. See Figure 6-42.

The propeller shaft assembly requires very little periodic service. The center support bearing is lubricated for life and requires no additional lubrication. The universal joints are all lubricated for life and cannot be lubricated while in the car. If a joint becomes worn or noisy, a service kit must be installed which consists of a spider complete with bearing assemblies and snap rings.

Front and rear propeller shafts will not be available separately, but only as a complete propeller shaft assembly; this is because the complete assembly must be given a careful rotating balance and this type of balancing equipment is not available in the field.

If any part of the propeller shaft requires repair, it is necessary to remove the complete propeller shaft assembly from the car. The assembly must be handled very carefully to avoid jamming or bending any of the parts.

If the car is to be undercoated, care must be taken to keep the propeller shaft completely free of undercoating material. Undercoating or any other material would upset the balance and might cause a serious vibration.

The center ball stud and socket must be lubricated every 5,000 miles with Multi-Purpose Grease EP No. 1 Grade. Refer to paragraph 1-4.

The slip spline must also be lubricated with Multi-Purpose Grease EP No. 1 Grade every 10,000 miles, or after disconnecting the slip joint for any reason. To lubricate the spline, remove the plug and install a grease fitting. When grease appears at the slip joint nut, remove the fitting and reinstall the plug. The plug must be in place as lubricant would be thrown out through the fitting by centrifugal force at high speeds. Refer to paragraph 1-5.

Two makes of propeller shaft assemblies are used: Saginaw and Spicer. An easy way to

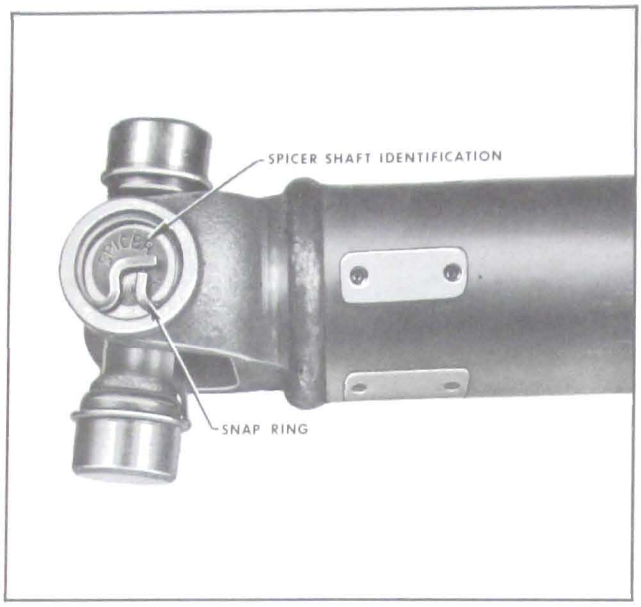

Figure 6-43—Propeller Shaft Type Identification

identify the type shaft used on a particular car is by noting the position of the snap rings which retain the universal joint bearings. Spicer shaft snap rings are located at the outer ends of the bearings (see Figure 6-43); Saginaw snap rings are located at the inner edges of the bearings.

6-13 REMOVAL OF PROPELLER SHAFT

Whenever service is required, the propeller shaft must be removed from the car as a complete assembly. During handling out of the car, the assembly must be supported in a straight line as nearly as possible to avoid jamming or bending any of the parts.

1. Remove two center bearing support to frame tunnel bolts.

2. At rear pinion flange, bend up lock plate tabs and remove U-bolt clamps from rear universal joint. CAUTION: If rear universal joint bearings are not retained on the spider by a connecting strap, use tape or wire to secure bearings.

3. Support rear end of propeller shaft to avoid damage to constant velocity universal joint and slide complete assembly rearward until front yoke slips from transmission shaft splines.

4. Protect the oil seal surface on the front slip yoke by taping or wiring a cloth over the complete front universal joint.

5. Slide complete propeller shaft assembly rearward through frame tunnel. Do not bend constant velocity joint to its extreme angle at any time.

6-14 DISASSEMBLY OF PROPELLER SHAFT

Propeller shaft assemblies are balanced very accurately at the factory by rotating the complete assembly at high speed in a special machine. Since it would be practically impossible to rebalance an assembly in the field, the larger parts (such as the front propeller shaft or rear propeller shaft, splined ball stud yoke, or link yoke) are not released as replacement parts. If any of these major parts are damaged, a complete new or factory rebuilt propeller shaft assembly must be installed.

Before disassembling a propeller shaft, the complete assembly must be marked so that each part can be reassembled in its original position to avoid out-of-balance vibration.

a. Disassembly of Slip Joint

For ease of handling and to help prevent damage to the constant velocity universal joint, the front and rear propeller shafts should be separated at the slip joint before any service operations are attempted.

1. Pry up rim of lockwasher to disengage flats on bearing locknut. Loosen locknut until free of threads and slide locknut and seal against constant velocity joint. See Figure 6-44.

2. Slide rear propeller shaft from front propeller shaft, making certain that index spring wire in splines is not lost.

b. Removal and Installation of Center Bearing

1. Support front propeller shaft assembly under center bearing support assembly. Drive propeller shaft down through center bearing using a soft hammer.

2. Remove front retainer ring and press out bearing.

3. Bearing against outer race press new bearing into assembly and reinstall retainer ring. Reinstall Support Assembly.

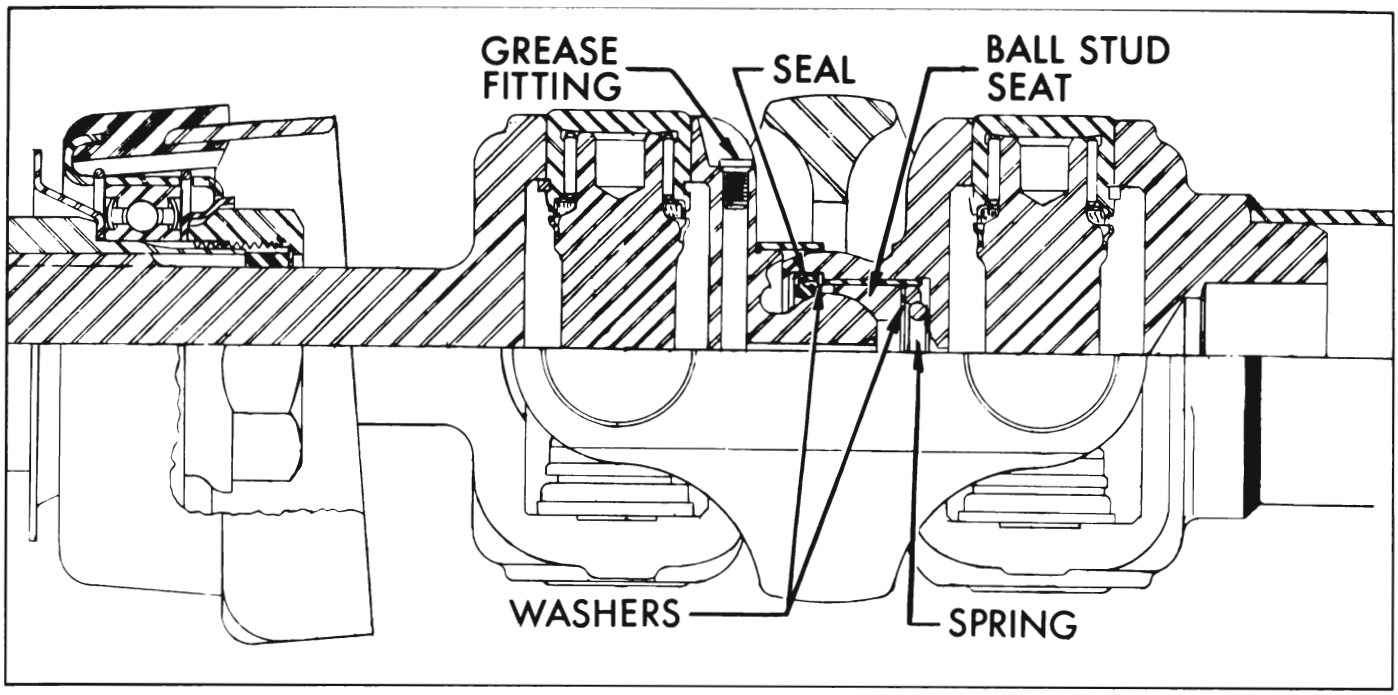

Figure 6-44—Constant Velocity Joint Ball Stud and Seat

c. Disassembly of Constant Velocity Universal Joint

All yokes must be marked before disassembly for reassembly in their original positions to maintain proper balance. Disassemble the rear section of the constant velocity joint first, then the forward section. Either section can be disassembled using the following procedure:

1. Remove snap rings from bearings using a punch on Saginaw shafts or needle nose pliers on Spicer shafts.

2. Clamp rear propeller shaft yoke in a vise. Shaft must be supported horizontally and link yoke must be free to move vertically.

3. Using a pipe coupling or a similar tool having an inside diameter of about 1 1/4 inches, apply force on link yoke around bearing. Drive link yoke downward until about 1/4 inch of bearing projects from yoke. CAUTION: Do not attempt to drive yoke down farther than ball and socket will allow easily. Extreme force will result in damage to the ball-socket assembly.

4. Rotate shaft 180 degrees and repeat steps 2 and 3.

5. Clamp 1/4 inch projecting portion of either bearing in vise and remove bearing by driving link yoke upward. Remove other bearing using same method.

6. Separate spider, shaft yoke and shaft from link yoke.

7. To remove bearings from shaft yoke, clamp spider in vise with vise jaws bearing against ends of spider journals. Yoke must be free to move vertically between jaws of vise.

8. Using same bearing remover tool, apply force on shaft yoke around bearing. Drive yoke downward until bearing is free of yoke.

9. Rotate shaft 180 degrees and repeat steps 7 and 8.

10. Disassemble forward section of constant velocity joint using same method as in steps 1 through 9. That is, drive link yoke down, pull bearings, and drive spline shaft yoke down to remove other two bearings.

d. Disassembly of Ball Stud Seat

1. Remove ball stud seal staking.

2. Pry out old seal.

3. Remove larger diameter washer, ball stud seats, smaller diameter washer, and spring.

e. Disassembly of Front and Rear Universal Joints

1. Remove snap rings from bearings using a punch on Saginaw shafts or needle nose pliers on Spicer shafts.

2. Clamp spider in vise with jaws bearing against ends of bearings which are not retained in shaft yoke. Shaft yoke must be free to move vertically.

3. Using a pipe coupling or a similar tool having an inside diameter of about 1 1/4 inches, apply force on yoke around bearing. Drive yoke downward until bearing is free of yoke and remove bearing.

4. Rotate shaft 180 degrees and repeat steps 2 and 3.

5. At front universal joint, separate spider and front yoke from shaft yoke.

6. To remove bearings from front yoke, clamp spider in vise with vise jaws against ends of bearing journals. Yoke must be free to move vertically between jaws of vise.

7. Using same bearing remover tool, apply force on front yoke around bearing. Drive yoke downward until bearing is free of yoke.

8. Rotate front yoke 180 degrees and repeat steps 6 and 7.

6-15 ASSEMBLY OF PROPELLER SHAFT

a. Assembly of Front and Rear Universal Joints

1. Position spider inside yoke.

2. Make certain bearings each have a full set of rollers and that seal is in position. Start bearings straight in holes of yoke, then install bearings by pressing between jaws of a vise. While pressing bearings into position, move spider back-and-forth to make sure spider journals engage bearings squarely to avoid damage.

3. Fully install bearings and install snap rings.

b. Assembly of Ball Stud Seat

1. Clean out seat hole thoroughly, then lubricate with Multi-Purpose Grease EP No. 1 Grade.

2. Install spring, small end first. Install smaller diameter washer, ball stud seats, and larger diameter washer. See Figure 6-44.

3. Install new seal with lip toward grease.

4. Stake seal in four places. Pack cavity with Multi-Purpose Grease EP No. 1 Grade.

c. Assembly of Constant Velocity Universal Joint

All yokes must be carefully assembled using the marks made before disassembly. Assemble the front section of the constant velocity first, then the rear section.

1. Position spider inside splined yoke.

2. Make certain bearings have a full set of rollers and that seals are in position. Start bearings straight in holes of splined yoke, then install bearings by pressing between jaws of a vise. Make sure spider journals enter bearings squarely to avoid damage.

3. Fully install bearings and install snap rings.

4. Position splined yoke and spider inside link yoke.

5. Make certain bearings have a full set of rollers and that seals are in position. Start bearings straight in holes of link yoke, then install bearings by pressing between jaws of a vise. Make sure spider journals enter bearings squarely.

6. Fully install bearings and install snap rings.

7. Position spider inside rear propeller shaft yoke.

8. Start bearings straight in yoke, then install bearings by pressing between jaws of a vise.

9. Fully install bearings and install snap rings.

10. Lubricate ball and socket with Multi-Purpose Grease EP No. 1 Grade. Position spider of rear propeller shaft assembly in link yoke. Engage socket with ball of splined yoke assembly. CAUTION: Make sure all marks made before disassembly are properly aligned.

11. Start bearings straight in link yoke, then install bearings by pressing between jaws of a vise. Push spring-loaded ball-socket assembly together to make sure spider journals enter bearings squarely to avoid damage.

12. Fully install bearings and install snap rings.

d. Assembly of Slip Joint

1. Make certain locknut, split washer and seal are in place on smooth part of spline shaft.

Make sure that index spring wire is in place in splines. Make sure that large lockwasher is in place on rear end of front propeller shaft.

2. Align index spring with missing internal spline in rear end of front propeller shaft and slide slip joint together.

3. Install locknut and tighten securely to 65 ft. lbs.

4. Bend in rim of lockwasher to engage flat of locknut firmly.

6-16 INSTALLATION OF PROPELLER SHAFT

The propeller shaft must be supported carefully during handling to avoid jamming or bending any of the parts.

1. Protect the oil seal diameter on the front slip yoke by taping or wiring a cloth over the complete front universal joint.

2. Slide complete propeller shaft assembly forward through frame tunnel.

3. Remove protecting cover from front universal joint. Fill space between lips of transmission seal with wheel bearing grease and apply a thin coat of the same grease to the seal surface of the front universal joint.

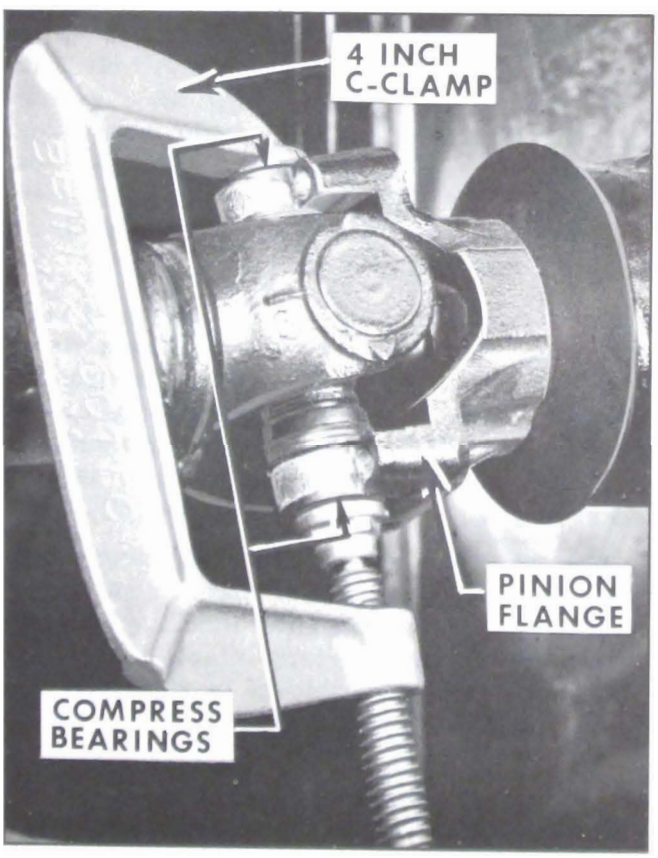

Figure 6-45—Using C-Clamp to Install a Universal Joint

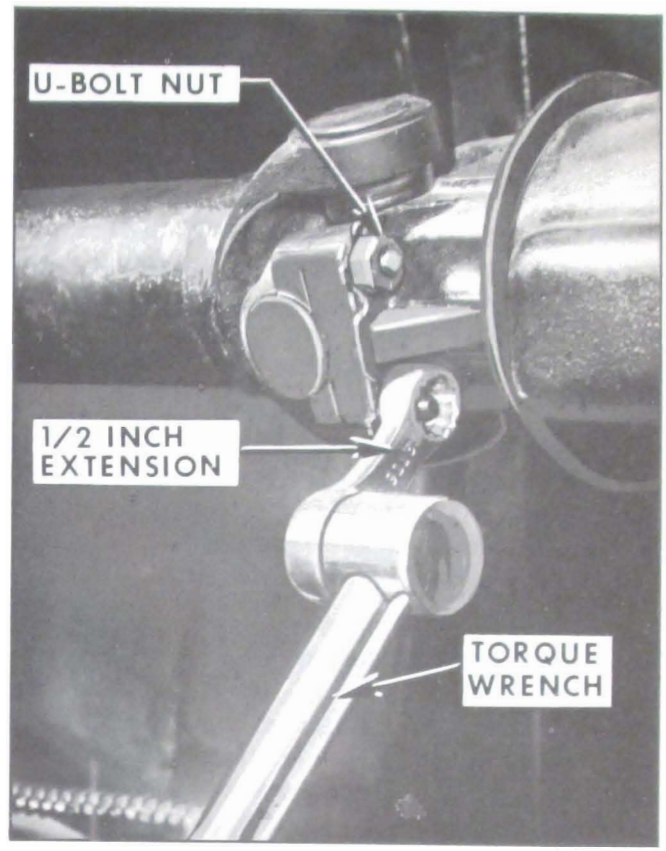

Figure 6-46—Using Extension to Torque U-Bolt Nuts

4. Slide front universal joint yoke forward over splines of transmission shaft.

5. Compress two loose bearings of rear universal joint toward each other using a 4 inch C-clamp. See Figure 6-45. This allows the bearings to seat in the pinion flange without the snap rings gouging the locating surfaces of the pinion flange while entering.

6. Install U-bolt clamps, new lock plates, and nuts. Draw nuts up evenly and torque to 13 ft. lbs. using a 1/2 inch extension such as J-913. See Figure 6-46. CAUTION: Overtightening U-bolt nuts distorts the bearings, causing a binding on the spider which can cause drive line shudder and also reduce the life of the bearings and spider.

7. Bend lock plate tabs against nuts.

8. Install two bolts in center bearing support. Torque to 20 ft. lbs.

9. Make certain propeller shaft slip spline and center ball stud seat are fully lubricated with Multi-Purpose Grease EP No. 1 Grade. See paragraphs 1-4 and 1-5 for lubricating procedure.

6-17 ADJUSTMENT OF REAR UNIVERSAL JOINT ANGLE

When torque is transmitted through any ordinary universal joint, the driven yoke fluctuates slightly in speed. In other words, although the driving yoke rotates at a constant speed, the driven yoke speeds-up and slows-down twice per revolution. This fluctuation of the driven yoke is in direct proportion to the angle through which the universal joint is operating; the greater the angle, the greater the fluctuation.

Whenever two universal joints are used, this fluctuation effect can be eliminated by staggering the joints so that the two driving yokes are 90° apart provided the two joints are transmitting torque through the same angle.

Therefore, when two universal joints are used, the angles through which they operate must be very nearly the same. This allows the alternate acceleration and deceleration of one joint to be offset by the alternate deceleration and acceleration of the second joint. When the two joints do not run at approximately the same angle, operation is rough and an objectionable vibration is produced.

In addition, universal joints are designed to operate safely and efficiently within certain angles. If the designed angle is exceeded, the joint may be broken or otherwise damaged.

The front universal joint angle is actually the angle between the engine-transmission centerline and the front propeller shaft. This angle is determined by the design of the body assembly. Since this angle is not liable to change with use, no means is provided for adjusting the front joint angle.

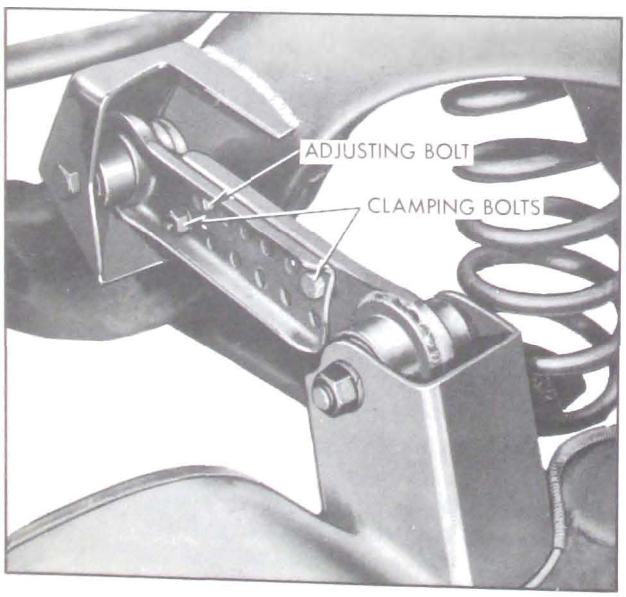

Figure 6-47—Upper Control Arm

The center constant velocity universal joint, just as the name implies, transmits at a constant velocity regardless of the angle through which it is operating. Therefore, no means is provided or needed for adjusting the constant velocity joint.

However, the rear universal joint angle can vary and must be adjusted. It is adjusted by rotating the rear axle housing; this is accomplished by lengthening or shortening the upper control arm by means of a "Vernier" arrangement of adjusting holes. See Figure 6-47.

If drive line shudder, roughness, vibration, or rumble is experienced, it may be due to incorrect rear universal joint angle and this angle should be checked. Also, if there is a severe rear end collision, or if the axle housing or any control arms are replaced, the rear universal joint angle should be checked and corrected if necessary.

A simple method has been developed for measuring rear universal joint angle using a spring-loaded steel cable stretched between the front of the chassis and the rear axle carrier. When the rear universal joint angle is adjusted correctly, this steel cable will clear the underside of the pinion flange by a definite amount. Therefore, if this single direct measurement is within specified limits, the rear universal joint angle is correct; if this measurement is out of limits, the joint angle is not correct. See Figure 6-48.

Rear universal joint angle is checked using Alignment Set J-8973. The Alignment Height Tubes J-8973-19 in this set are designed to raise the rear of the car slightly above normal trim height. Use of these tubes makes sure that the rear universal joint angle will be checked at a predetermined trim height.

The front end of the cable is equipped with two attaching brackets so that the cable may be used on all series 1962 Buicks. The rear end of the cable has stops attached at various points to allow the cable to be placed in tension on all wheelbase Buicks.

a. Checking Rear Universal Joint Angle

Check rear universal joint angle using the following procedure:

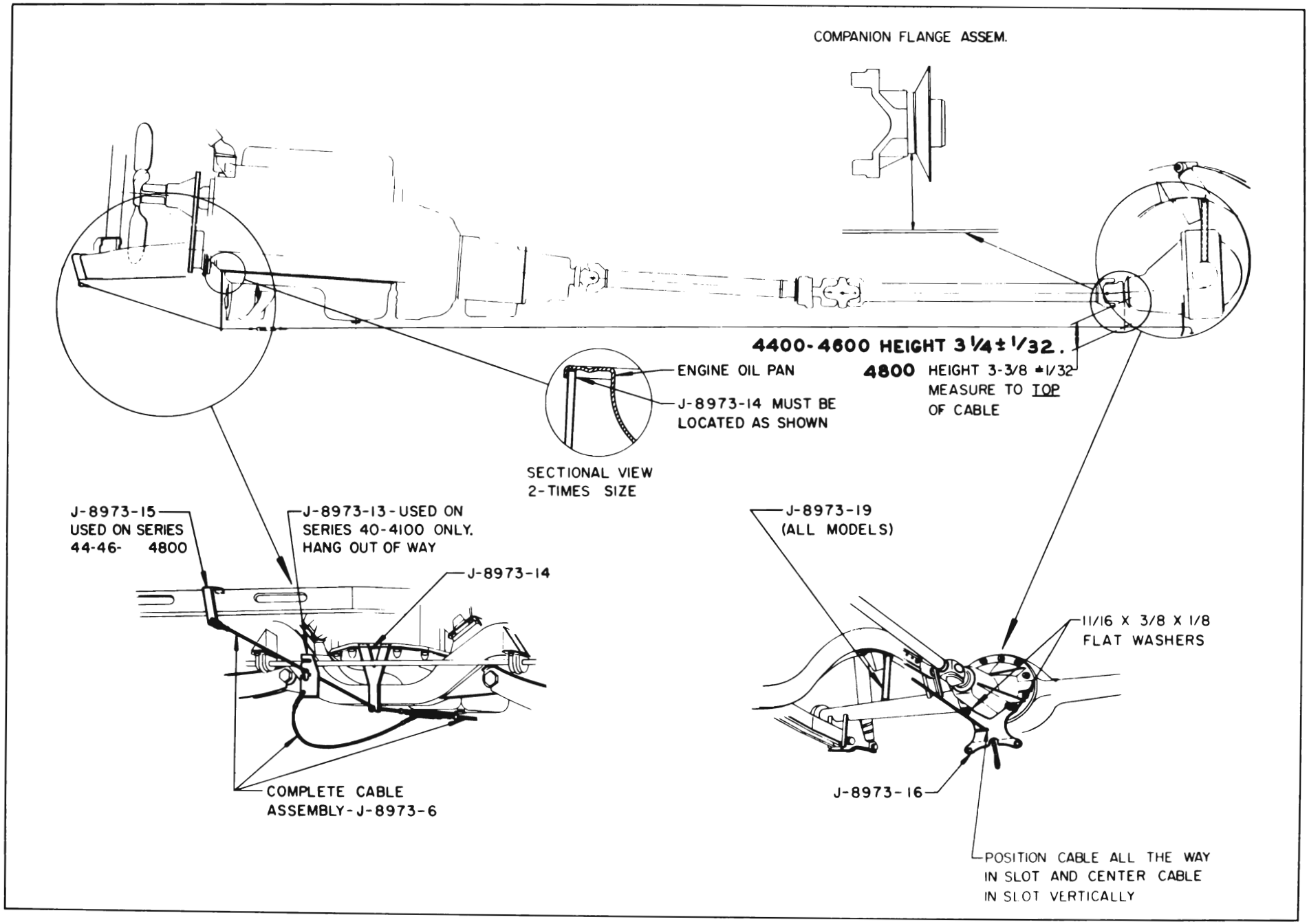

Figure 6-48—Checking Rear Universal Joint Angle

1. Raise car, preferably on a drive-on hoist. Install Alignment Height Tubes J-8973-19 by raising the rear of the body slightly with one hand while inserting the upper end of the tube over the head of the axle bumper rear bolt, with the lower end resting on the axle housing. See Figure 6-48. If the body does not come down firmly on the tubes, add weight in the trunk until the tubes are held tightly.

2. Remove two differential carrier mounting nuts, one on each side of the lowest nut. Install two special flat washers over studs, then install Rear Bracket J-8973-16 with bent edge toward front and slot to the right, using nuts just removed. See Figure 6-48.

3. Take cable assembly and hook Front Attaching Bracket J-8973-15 over center of front frame cross member. Pull cable tight and position cable all-the-way in slot of rear bracket so one of the stops is to the rear of the bracket.

4. Position Engine Height Plate J-8973-14 vertically with wide end centered against front flange of engine pan. Pull cable down and place in lower notch of plate. See Figure 6-48.

5. Measure perpendicular distance from machined surface immediately in front of slinger on rear pinion flange to top of cable. This distance should be 3-3/8" ±1/32" on the 4800 Series and 3-1/4" ±1/32" on the 4400 and 4600 Series.

b. Adjusting Rear Universal Joint Angle

If the distance measured in Step 5 above was not correct, the pinion nose must be moved up or down as required. This is done by changing the length of the upper control arm.

Adjust rear universal joint angle using the following procedure:

1. Place a jack under pinion nose. Because of the geometry of the rear suspension, the pinion nose will tend to move downward when released and must be held upward.

2. Loosen nuts and bolts at two slotted holes

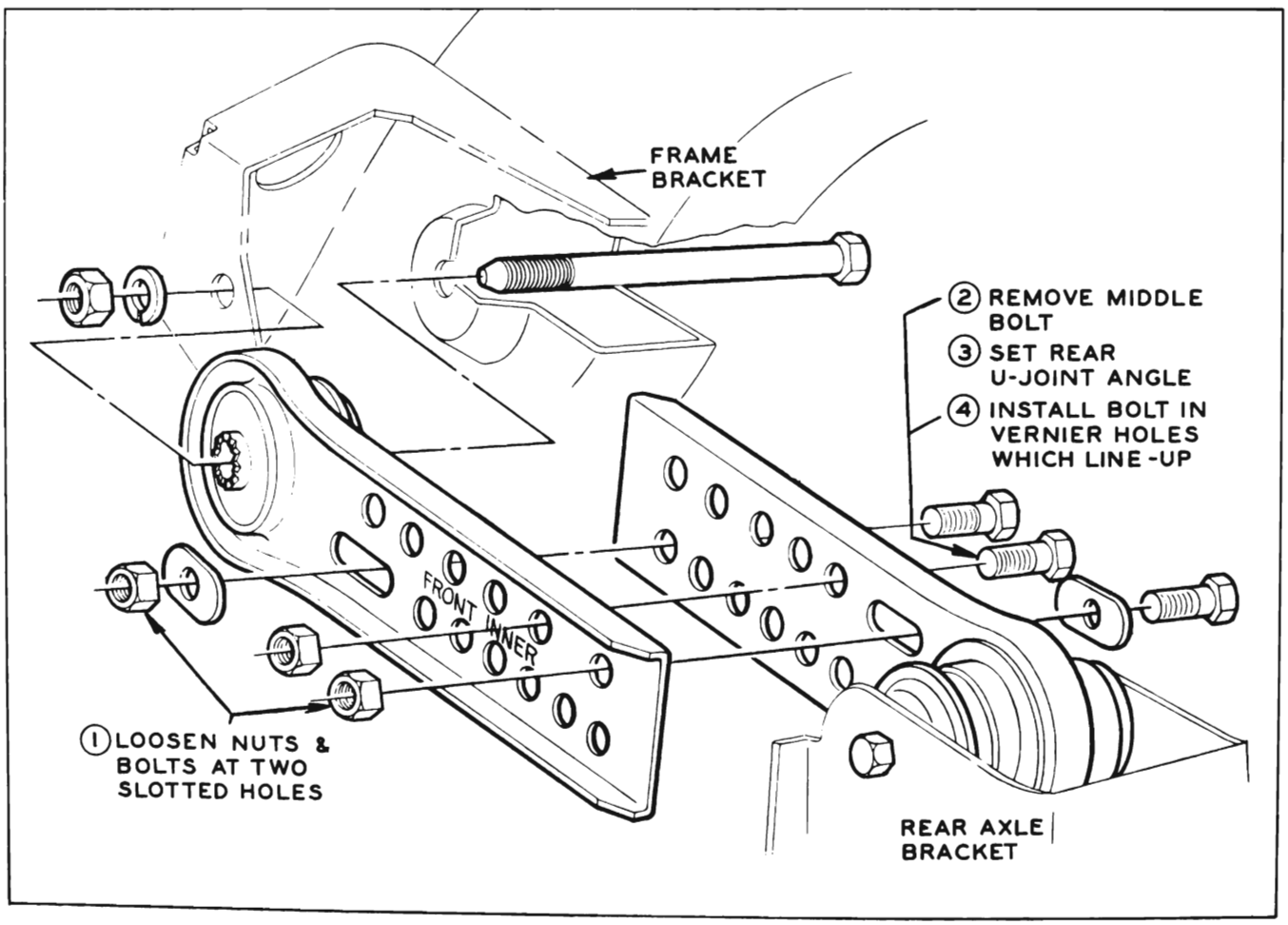

Figure 6-49—Adjusting Rear Universal Joint Angle

and remove middle adjustment bolt. See Figure 6-49.

3. Using jack, raise or lower pinion nose as required to get correct measurement from pinion flange to top of cable.

4. Install adjustment bolt in holes which line-up and tighten nut.

5. Lower jack from under pinion nose and recheck measurement. If measurement is slightly off, a fine adjustment can be made by simply loosening all three upper arm nuts and bolts, moving the pinion nose in the desired direction, then retightening the nuts and bolts. This finer adjustment is possible because of some looseness of the adjustment bolt in its holes.

6. Torque upper arm nuts and bolts to 60 ft. lbs. minimum.

7. Remove all parts of the alignment set, being careful to avoid kinking cable in handling and storing.

8. Reinstall differential carrier nuts and torque to 50 ft. lbs.