Chapter 4
Wheel suspensions

Fault diagnosis

Diagnosis	Remedy
Noise and knock in suspension at vehicle movement	
1. Faulty shock-absorbers	1. Replace or repair shock absorbers
2. Loose anti-roll bar fastening bolts	2. Tighten securing nuts and bolts; in case of rubber pad wear - replace
3. Worn arm silent blocks	3. Renew silent blocks
4. Loose shock-absorber fastening or worn shock absorber eye rubber bushes	4. Tighten fastening bolts and nuts, renew bushes in shock absorber eyes
5. Worn arm balljoints	5. Renew ball joints
6. Excessive gap in wheel hub bearings	6. Adjust clearance or replace bearings
7. Wheels significantly out of balance	7. Balance wheels
8. Deformed wheel discs	8. Replace discs
9. Set down or broken springs	9. Renew spring
10. Worn rear suspension bar rubber bushes	10. Renew rubber bushes
11. Knock in "stiff" suspension due to damaged buffers	11. Replace damaged buffers
12. Rear suspension "stiffness" due to rear axle overload	12. Unload vehicle rear part
Wheel alignment angles can not be adjusted	
1. Deformed lower arm shaft or suspension arms	1. Replace shaft or arm
Vehicle wandering	
1. Different pressure in tyres	1. Adjust pressure in tyres
2. Misalignment of front wheels	2. Align wheels
3. Wrong gap in front wheel bearings	3. Adjust bearing clearance
4. Deformed suspension arms	4. Replace deformed arms
5. Unequal tension of suspension springs	5. Renew weak spring
6. Incomplete release of wheel brake mechanism	6. Rectify fault
7. Significant difference in tyres wear	7. Replace worn tyres
8. Front wheels significantly out-of-balance	8. Balance wheels
9. Displacement of rear axle due to deformation of rear suspension bar	9. Straighten or replace suspension arms
Shimmy	
1. Insufficient tyres pressure	1. Adjust pressure in tyres
2. Excessive gap in front wheel hub bearings	2. Adjust clearance
3. Shock-absorbers do not work	3. Renew shock absorbers or repair
4. Loose fastening nuts on balljoint pins	4. Tighten nuts
5. Misalignment of front wheels	5. Align wheels
6. Worn arm shaft silent blocks	6. Renew silent blocks
7. Wheels are significantly out of balance	7. Check and balance wheels
8. Worn arm balljoints	8. Replace joints
Often "stiffness" in suspension	
1. Suspension springs set down	1. Renew springs
2. Shock-absorbers do not work	2. Renew shock absorbers or repair
3. Deformed front suspension arms	3. Renew deformed arms
Excessive gap in balljoints	
1. Worn balljoint rubbing surfaces as a result of fouling due to leaks in shroud or its damage	1. Replace ball joint and boot

Diagnosis	Remedy
Un-even tyre tread wear	
1. Excessive speed at cornering	1. Low down speed
2. Excessive wear of suspension joints and bushes	2. Repair suspension
3. Wheels out of balance (stains in regular intervals on tread outer path and on central path when driving with a disbalanced wheel for a long time)	3. Balance wheels
4. Uneven wheel braking	4. Adjust braking system
5. Shock-absorbers do not work	5. Renew shock absorbers or repair
6. Wheel camber misalignment (wear of tread inner path)	6. Align wheel camber
7. Low tyre pressure (large wear on tread edge)	7. Adjust to normal pressure
8. Excessive tyre pressure (large wear in tread middle part)	8. Adjust to normal pressure
9. Low front wheel toe-in (wear of tread inner path)	9. Adjust wheel toe-in
10. Excessive front wheel toe-in (wear of tread outer path)	10. Adjust wheel toe-in
Wheel runout	
1. Wheel out of balance: - uneven tread wear - displacement of balance weights and tyres at installation - deformed rim - damaged tyres	1. Do the following: - balance or replace wheels - balance wheels - rectify rim or replace, balance wheels - replace tyre and balance wheels
2. Excessive gap in wheel hub bearings	2. Adjust clearance
Liquid leak from shock-absorber	
1. Wear or destruction of rod sealing	1. Replace oil seal
2. Foreign particles on sealing surfaces	2. Wash shock absorber components, renew or filter liquid
3. Dent, risks, scuffings on rod, complete wear of chrome coating	3. Renew worn or damaged rod and oil seal
4. Loose tank nut	4. Tighten nut
5. Tank damage in zone of sealing ring	5. Renew or repair tank
6. Shrinkage or damage of tank sealing ring	6. Renew ring
7. Excessive amount of liquid in shock-absorber	7. Ensure required amount of liquid
Insufficient shock-absorber resistance at recoil stroke	
1. Leaking recoil valve or bypass valve	1. Renew damaged valve components or repair
2. Piston ring broken or stuck in flute	2. Renew ring or rectify sticking
3. Insufficient amount of liquid due to leak	3. Renew damaged components and top up liquid
4. Scuffings on piston or cylinder	4. Renew damaged components and liquid
5. Worn guide bush opening	5. Replace guide bush
6. Impurities in liquid	6. Wash all parts, renew liquid
7. Recoil spring set down	7. Replace spring
Insufficient shock-absorber resistance at compression stroke	
1. Compression valve leak	1. Renew damaged components or repair
2. Insufficient amount of liquid due to leak	2. Renew damaged components and top up liquid
3. Worn guide bush and rod	3. Renew worn parts
4. Impurities in liquid	4. Wash all parts, renew liquid
5. Worn or damaged compression valve discs	5. Renew damaged components
Shock-absorber knock and squeak	
1. Worn rubber bushes in eyes	1. Renew bushes
2. Impact deformation of boot	2. Renew or repair boot
3. Insufficient amount of liquid due to leak	3. Renew damaged components and top up liquid
4. Loose tank and piston fastening nuts	4. Tighten nuts
5. Jammed rod due to deformation of cylinder, tank or rod	5. Renew damaged components or repair
6. Loose shock-absorber fastening nuts	6. Tighten nuts
7. Damaged components of shock-absorbers	7. Renew damaged components

Diagnosis	Remedy
Excessive wear of tyre tread	
1. High driving speed	1. Choose speed according to road conditions
2. Heavy vehicle acceleration	2. Avoid sharp acceleration
3. Often braking	3. Use brakes correctly
4. Wrong wheel alignment angles	4. Adjust wheel alignment angles
5. Excessive clearance in front wheel hub bearings	5. Adjust clearance
6. Vehicle overload	6. Avoid vehicle overload
7. Recommended rearrangement of wheels was not carried out	7. Rearrange wheels on vehicle according to service manual
Tyres squeal at cornering	
1. Abnormal tyre pressure	1. Ensure normal pressure
2. Wrong wheel alignment angle	2. Adjust wheel alignment angles
3. Deformed suspension arms, crossmember or body front elements	3. Replace deformed parts, rectify body front elements

Front suspension

The design of the front suspension is shown on fig. 4-1.

Suspension components - inspection

At each maintenance and repair, it is necessary to inspect the protective covers of suspension balljoints, paying special attention to any possible mechanical damages. It is necessary to check the suspension components for traces of hitting the road obstacles or car body, for cracks on the suspension components, deformations of lower arm shaft, crossmember or suspension arms and elements of body front, and also to check the condition of balljoints and silent blocks.

The deformations of lower and upper arm shafts is determined by visual check.

The deformation of the front suspension crossmember is determined by measuring the distance between the outer surface of the crossmember bracket in the zone of the upper arm shaft fastening bolt. This distance should be (736±1.5) mm.

If the crossmember is so badly deformed, that it is impossible to adjust the wheel alignment angles with the help of washers, but at satisfactory condition of all suspension components, renew the crossmember.

The condition of the silent blocks is checked in the following order:

- ensure there are no deformations of the suspension arms, the lower arm shaft, the suspension crossmember;

- raise the vehicle front wheels;

- measure the outer bush 2 radial displacement A (fig. 4-2) in relation to the inner bush 6 and distance B between the thrust washer 5 and the outer end face of the outer bush 2.

The silent blocks of the top and lower arms are subject to replacement in case of:

- breaks and one-sided "buckling" of rubber;

- undercutting and wear of rubber on the end faces of joints;

- if the outer bush radial displacement **A** relative to the inner bush exceeds 2.5 mm;

- if size **B** is not within the limits of 3-7.5 mm.

If size **B** exceeds the specified limits, check the press fitting of the silent block in the arm socket.

The gap in the upper balljoints is checked in the following order:

- place the vehicle on an even horizontal platform with hard surface;

- lift the right (left) front part of the vehicle and take off the wheel;

- put a 230 mm wooden pad under the lower arm, which is closer to the ball pin, and lower the vehicle on it;

- ensure, that resin does not come out from the runner channel of the upper ballpin housing, if necessary smooth with a file to avoid errors when measuring;

- fix tool indicator bracket 4 (fig. 4-3) on the top of stub axle;

- place the indicator 2 in centre of the pin balljoint housing 3 sphere with small preliminary preload, and then align the zero division of the scale with the arrow;

- fix a fork lever 5 with length of 0.7 m on the front suspension upper arm;

- using dynamometer 6 create load of 196 N•m (20 kgf•m) (on the fork lever end 294 N) in vertical direction, first to press-in, and then to pull out the ball pin from the joint housing;

- record the maximum deviations of the indicator arrow;

- calculate the meaning of the clearance in the upper balljoint by summing the values of deviations from zero;

- the total indicator readings should not exceed 0.8 mm.

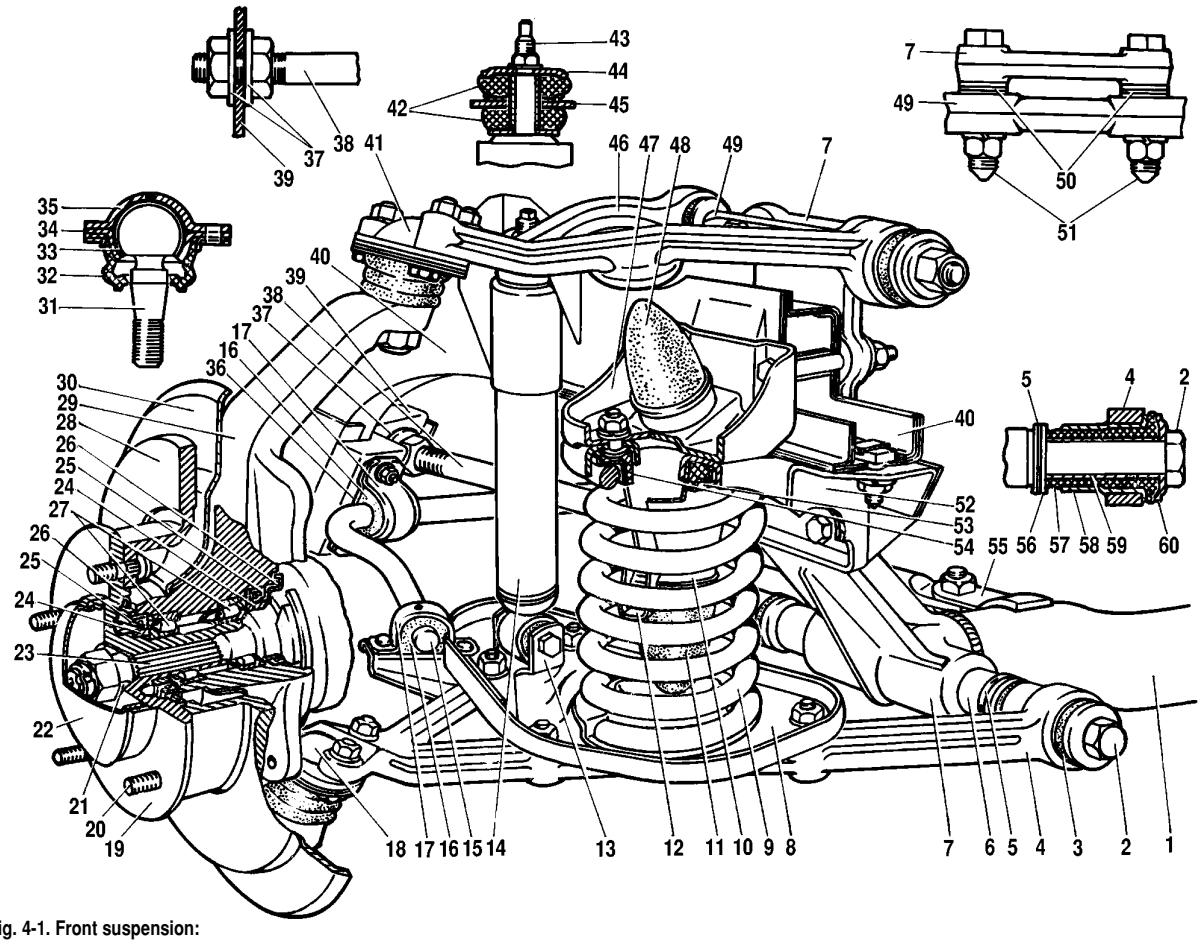

Fig. 4-1. Front suspension:

1 - front suspension crossmember; 2 - lower control arm shaft; 3 - lower arm silent block; 4 - lower control arm; 5 - lower control arm shims; 6 - lower control arm shaft bush; 7 - crossmember bracket; 8 - coil spring lower seat; 9 - coil spring; 10 - compression buffer mounting strut; 11 - compression buffer; 12 - compression restrictor; 13 - shock absorber mounting bracket, lower; 14 - shock absorber; 15 - anti-roll bar; 16 - rubber pad; 17 - anti-roll bar securing clamp; 18 - lower balljoint; 19 - wheel hub; 20 - wheel and brake disc securing bolt; 21 - taper bush; 22 - cap; 23 - outer CV-joint housing tail; 24 - oil seal bush; 25 - oil seal; 26 - splash guard ring; 27 - wheel hub bearings; 28 - wheel disc; 29 - steering knuckle; 30 - front brake splash guard; 31 - ballpin; 32 - boot; 33 - bearing; 34 - ballpin liner race; 35 - ballpin bearing housing; 36 - anti-roll bar securing plate; 37 - washers; 38 - tie-rod; 39 - tie-rod mounting bracket; 40 - body chassis arm; 41 - upper ball joint; 42 - shock absorber rod mounting pad; 43 - shock absorber rod; 44 - washer; 45 - shock absorber mounting bracket; 46 - upper control arm; 47 - recoil buffer bracket; 48 - recoil buffer; 49 - upper arm shaft; 50 - shims; 51 - upper arm shaft securing bolts; 52 - suspension spring mounting, upper; 53 - suspension spring seat, upper; 54 - spring sealing gasket; 55 - crossmember-to-tie-rod securing bracket; 56 - thrust washer; 57 - balljoint rubber bush; 58 - balljoint sleeve, outer; 59 - balljoint sleeve, inner; 60 - balljoint thrust washer

Front wheel alignment angle - checking and adjustment

The check and adjustment of the front wheel alignment angle is carried out on special test-benches according to the instructions.

ATTENTION. It is necessary to check the wheel alignment angle after replacement or repair of suspension components, that could have caused the misalignment of wheel angle.

The check and adjustment of wheel angles is carried out on a vehicle under static load of 3140 N (320 kgf) (four men and 40 kg in boot).

Follow the parameters specified in tab. 4-1 to check and adjust the wheel alignment angles.

Table 4-1

Front wheel alignment angle parameters

Front wheels alignment angle	for vehicle with load 3140 N (320 kgf)	vehicle kurb weight
Camber	0°30' ± 20' (0°30' $^{+40'}_{-30'}$) *	0°20' ± 20' (0°20' $^{+40'}_{-30'}$) *
Caster	3°30' ± 30' (3°30' $^{+60'}_{-90'}$) *	1°30' ± 30' (1°30' $^{+60'}_{-90'}$) *
Toe-in	2... 4 mm (1... 7 mm) *	4.5.... 6.5 mm (3.5... 9.5 mm) *

** permissible front wheel alignment angle for the elastic elements stabilization time before the first maintenance (2000-3000 km).*

Before adjusting the wheel alignment angles check the following:

- pressure in tyres;
- axial gap in front wheel hub bearings;
- serviceability of shock-absorbers (absence of rod jamming);
- radial and axial runout of tyres;
- gap in suspension balljoints;
- free play of steering wheel.

Rectify any detected malfunctions and make necessary adjustments.

After placing the vehicle on a test-bench, immediately prior to inspection, apply 2 or 3 times a downward force of 392-490 N (40-50 kgf) first on the rear bumper and then on the front one.

The wheel alignment angle should be checked and adjusted in the following sequence:

1. Caster angle
2. Camber angle
3. Toe-in

Caster angle. If the check will show that the angle size does not correspond to the above data, it is necessary to change the quantity of adjusting washers 50 (see fig. 4-1) between the upper arm shaft and the crossmember arm (see tab. 4-2).

Table 4-2

Camber and caster angle vs. number of washers in a set

Number of washers added to the set or withdrawn		camber	caster
front bolt	rear bolt		
+1	+1	+ (8' 42")	0
-1	-1	- (8' 42")	0
+1	0	- (7' 30")	+ (20' 24")
-1	0	+ (7' 30")	- (20' 24")
0	+1	+ (15' 18")	- (25' 18")
0	-1	- (15' 18")	+ (25' 18")
-1	+1	+ (27' 30")	- (43' 18")
+1	-1	- (21' 36")	+ (40')

Note. *Data are given for washers with thickness of 0.75 mm. Plus - adding a washer, minus - removing a washer.*

To adjust the caster angle:

- undo the fastening nuts of the front suspension upper arm shaft and replace the washers from one bolt to the other one until a normal reading of the angle will be obtained. The caster angle increases at rearrangement of washers from the rear bolt to the front one and decreases at reverse swapping;
- tighten the nuts with a torque wrench and check the caster angle.

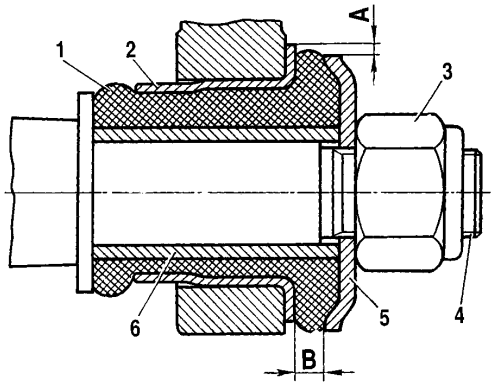

Fig. 4-2. Inspection of the front suspension arm silent block:
1 - rubber bush; 2 - outer bush; 3 - shaft securing nut; 4 - suspension arm shaft; 5 - thrust washer; 6 - inner bush

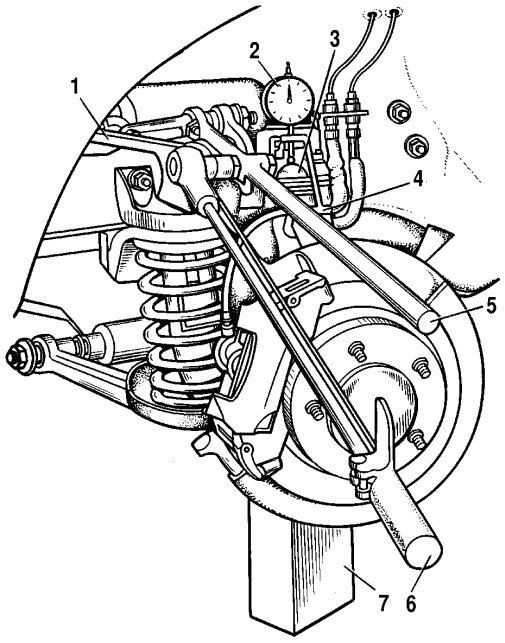

Fig. 4-3. On-vehicle check of the clearance in the suspension upper balljoint:
1 - upper control arm; 2 - indicator; 3 - upper balljoint housing; 4 - indicator fastening bracket; 5 - control arm; 6 - dynamometer; 7 - block

Front wheel camber. If the camber angle differs from normal, it should be adjusted by changing the amount of washers 50 (see fig. 4-1) between the upper arm shaft and crossmember bracket.

To reduce the camber angle remove the same amount of washers from both bolts, and to increase - add.

Front wheel toe-in. If the toe-in differs from normal value, it is necessary to slacken the fastening clamps on the side tie-rods and using tool 67.7813.9504 identically turn both adjuster pins in opposite directions; thus the pins are turned on or off and change the length of side tie-rods.

After adjustment, refit the fastening clamps with the slot facing back with allowable deviation downward by 60° to the horizontal plane of the vehicle. With the nuts tightened the clamp slot edges should not contact.

After toe-in adjustment, ensure that wheels and steering mechanism components do not hit the adjacent components of the suspension and car body. To do this, turn the wheels fully right and left until the steering pitman arm will rest against the steering mechanism housing fastening nuts.

Front wheel hub bearing gap - check and adjustment

To check the gap, remove the cap and slacken the wheel fastening nut, lift the front part of the vehicle, rest it on a support and take off the front wheel.

Remove the front brake caliper with brake pads. Do not allow the caliper to hang on high pressure hoses.

Fix tool 67.7834.9507 with indicator (fig. 4-4) on the steering knuckle so that the indicator leg will rest against the wheel hub as closely as possible to the adjusting nut. Turn the hub in both directions and simultaneously move it with lever 67.7820.9521 along the steering knuckle shaft (forward and backward). Measure the size of shift (gap) by the indicator.

If the gap is more than 0.15 mm, adjust it in the following order:

- undo the adjusting nut from the outer joint housing tail;

- fit a new or used, but on other vehicle, nut and tighten with torque to 19.6 N•m (2 kgf•m), simultaneously turning the hub in both directions 2-3 times for self-setting the roller bearings;

- slacken the adjusting nut and again tighten with torque to 6.86 N•m (0.7 kgf•m);

- make a mark **B** on the washer (fig. 4-5), then undo the nut by 20-25° until the first edge will meet the **A** mark;

- fix the nut in this position by pressing the cups on the journal into the grooves on the outer joint race tail end.

After adjustment the bearing clearance should be within the limits of 0.01-0.07 mm.

Front wheel hub bearing - renewing the greasing

To renew the greasing do the following from both sides of the vehicle:

- raise the front part of the vehicle and take off the wheel;

- unbend the edge of the brake front splash guard, undo the fastening bolt of the brake pad carrier and remove the brake caliper from the brake disc by moving it aside. Do not disconnect the brake hoses, to avoid air penetration in the hydraulic system, and do not leave the caliper to hang on the hoses;

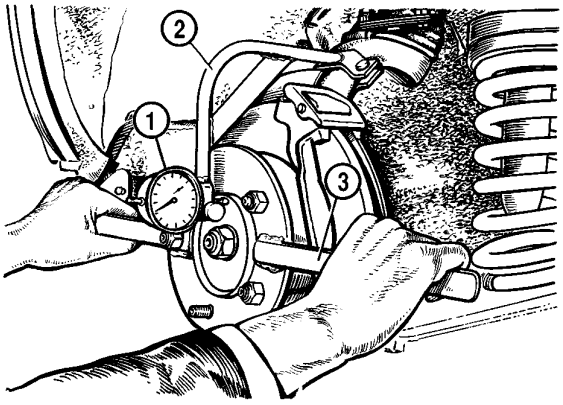

Fig. 4-4. Checking the axial gap in the front wheel hub bearings:
1 - indicator; 2 - fixture 67.7834.9507; 3 - lever 67.7820.9521

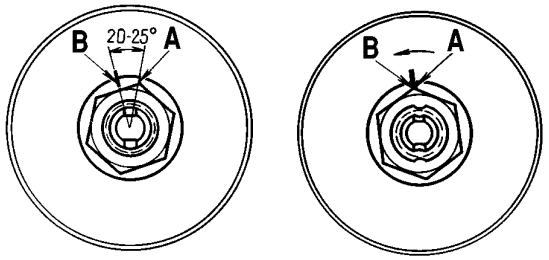

Fig. 4-5. Tightening and adjusting the front wheel hub bearings:
A - nut edge; B - mark on the nut

- use tool 67.7823.9514 to remove the wheel hub cap, undo the adjusting nut and remove bush 21 (see fig. 4-1);

- carefully, so that not to damage sealing 25, remove hub 19 in assembly with the brake disc;

- put a support under the suspension lower arm 4 and slightly lower the front part of the vehicle to compress spring 9;

- disconnect the lower balljoint 18 from the suspension arm;

- disconnect the shock-absorber 14 from the lower arm 4 and steering drive side tie-rod from the steering knuckle shaft 29;

- move the front wheel drive shaft fully forward to the front axle;

- by turning the steering knuckle 29 relatively the upper balljoint 41, remove the knuckle from the joint casing tail 23;

- using tool 67.7853.9535 with washer 67.7853.9540 press out from the cavity of the steering knuckle the inner rings of bearings 27 with dismantling rings and seals 25. The bearing outer rings are pressed off using washer 67.7853.9534, and press-fitted with tool 67.7853.9536. Mark the bearing rings so that to put them on former place when reassembling;

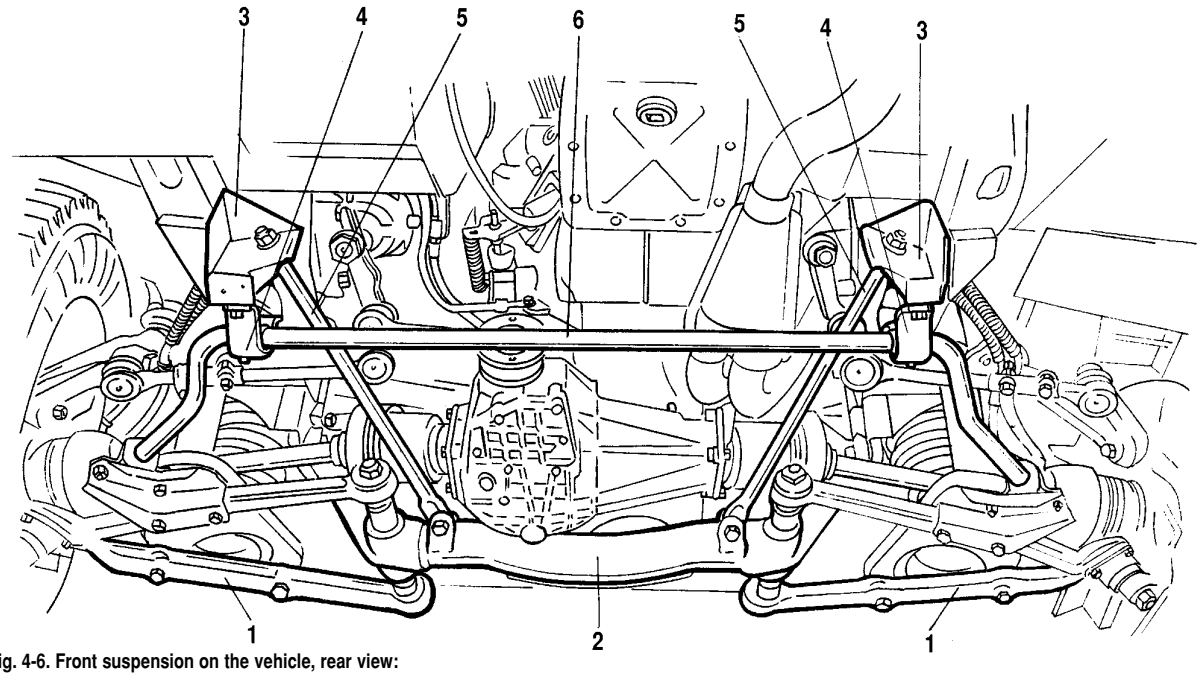

Fig. 4-6. Front suspension on the vehicle, rear view:
1 - lower control arm; 2 - crossmember; 3 - tie-rod fastening bracket; 4 - anti-roll bar-to-body securing bracket; 5 - tie-rod; 6 - anti-roll bar

- remove old greasing and wash with kerosine the inner cavity of the steering knuckle, the outer and inner cavities of the hub, the CV-join case tail and bearings;

- fill 40 gr of fresh ЛИТОЛ-24 in bearing cages, spread evenly in the cavity of the steering knuckle between the bearings, grease the splines of the joint casing tail;

- fit the bearing inner rings, the oil seal bush and press fit the sealings;

- fit the steering knuckle on the joint case tail and connect the balljoint to the lower arm;

- fix the shock-absorber and attach the side tie-rod of the steering mechanism to the steering knuckle arm;

- fit the hub in assembly with brake disc on the joint case tail and establish the taper bush 21;

- turn the new adjusting nut and adjust the gaps in wheel hub bearings;

- using tool 67.7853.9528 fit the wheel hub cap;

- replace the brake caliper and the wheel.

Note. *In all cases, when the nut is unscrewed from the tail of the outer joint case, renew the nut or use one from another vehicle*

Balancing the wheels

The wheels are balanced on special benches according to the instructions attached to the test-bench. The wheel out-of-balance is eliminated by balance weights, which are fastened on the rim with special springs.

Front suspension - removal and refitting

Place the vehicle on the lift or over an inspection pit, set the parking brake, open the hood and take out the spare wheel.

Place supports under rear wheels and take off front wheels.

Using remover 67.7824.9516 (see fig. 5-10) press out pins from the steering knuckle arms and draw aside the steering tie-rods.

Disconnect the anti-roll bar 6 (fig. 4-6) from the suspension lower arms.

Disconnect the tie rods 5 from body brackets and the crossmember.

Disconnect the shock-absorbers from the suspension lower arms.

Remove the engine crankcase protective plate and the splash guard.

Remove from each side the front brake caliper without disconnecting the brake hoses, and suspend it so that the caliper will not hang on hoses.

Compress the suspension spring to completely unload the lower arm.

Disconnect from the lower arm the balljoint and take off the spring, having smoothly unloaded it, repeat the procedure for the other unit of the suspension.

Disconnect the upper arm shaft 49 (see fig. 4-1) from suspension crossmember bracket 7 and remove the upper arm 46 in assembly with the steering knuckle, wheel hub, front brake and the outer joint case.

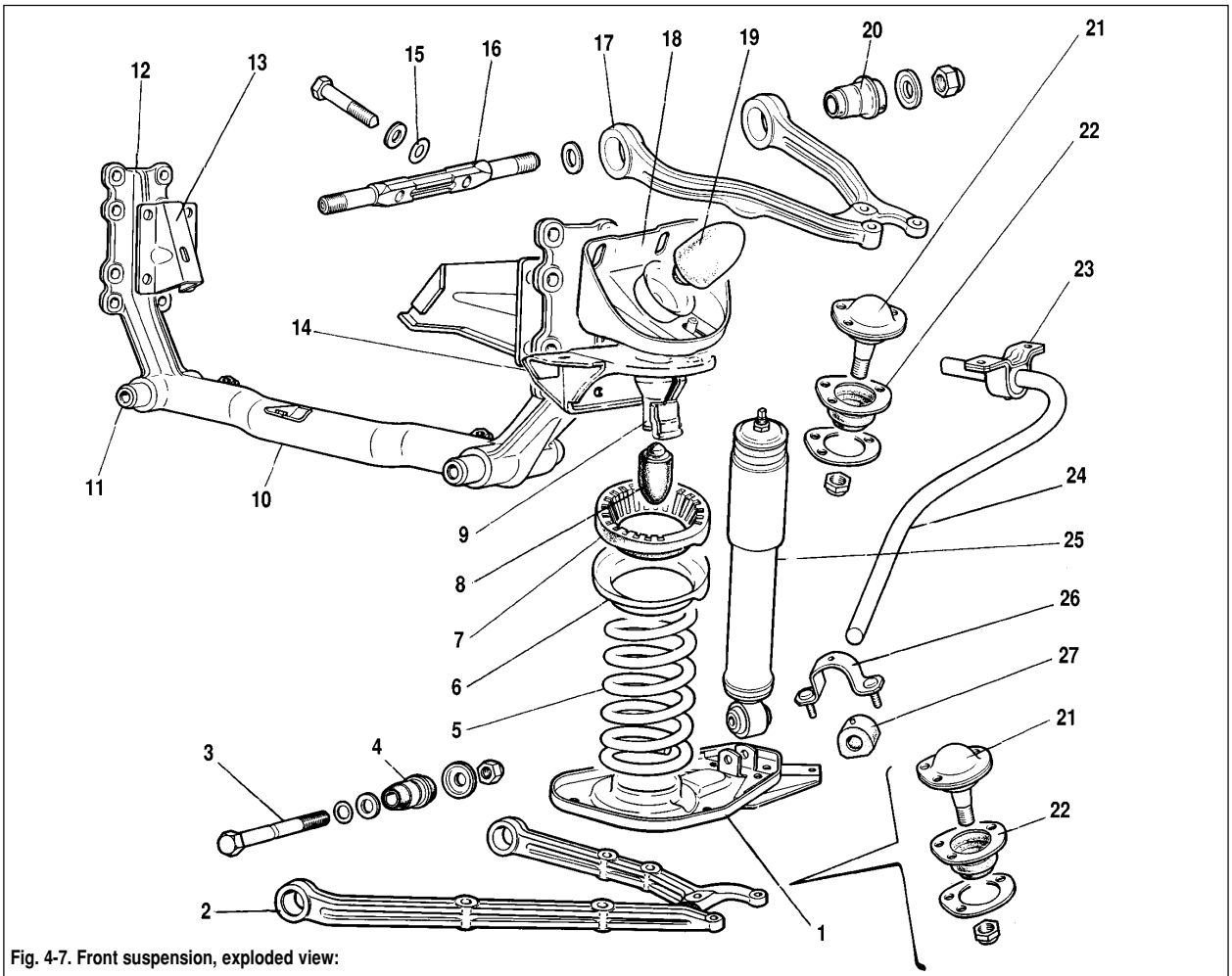

Fig. 4-7. Front suspension, exploded view:
1 - coil spring lower seat; 2 - lower control arm; 3 - lower arm shaft; 4 - lower control arm silent block; 5 - coil spring; 6 - upper seat; 7 - spring insulator gasket; 8 - compression buffer; 9 - compression restrictor; 10 - suspension crossmember; 11 - lower control arm shaft bush; 12 - crossmember bracket; 13 - engine mounting bracket; 14 - spring upper mounting; 15 - shim; 16 - upper control arm shaft; 17 - upper control arm; 18 - recoil buffer bracket; 19 - recoil buffer; 20 - upper control arm silent block; 21 - balljoint; 22 - boot; 23 - body - to - tie-rod mounting bracket; 24 - tie-rod; 25 - shock absorber; 26 - securing clamp; 27 - rubber pad

Note. *When removing the upper arm shaft, note the amount and arrangement of washers between the upper arm shaft and the crossmember, and also the number of shims between the crossmember and car body chassis arm, so that at refitting all washers and shims will be properly replaced.*

Disconnect the engine mounting rubber pads from the crossmember brackets.

Place a hydraulic jack with a fixing tool under the suspension crossmember, support the engine with arm 67.7820.9514 or hoist, disconnect the recoil bumper bracket 47 and the crossmember from the body chassis.

Remove the crossmember 1 in assembly with lower arms 4.

The installation of suspension parts and units is done in reverse order. The springs on the suspension should be installed only of one class (class **A** - not marked or has marks by white paint, class **B** - with black marks on the outer surface of the coils). It is permissible to install springs of A class on the front suspension, if B class springs are fitted on the rear suspension.

After reassembly and suspension refitting, check the wheel alignment angles and toe-in.

Suspension units - dismantle and reassembly

Dismantle. If the suspension repair requires complete dismantle of the units, it is more convenient to begin directly on the vehicle after removing the crankcase protective plate and the splash guard.

Proceed as follows:

- undo the upper balljoint 41 (see fig. 4-1) pin nut and remove the clips from hoses;

- unbend the protective casing blades, turn out the fastening bolt of the caliper carrier and move the whole assembly aside;

ATTENTION. To avoid damaging the hoses do not leave the caliper to hang on hoses.

- using tool 67.7823.9514 remove the hub cap and undo the wheel hub bearing nut;

- remove the front wheel hub in assembly with the brake disc, using pusher 67.7823.9516;

- remove the front brake splash guard;

- remove the front suspension shock-absorber;

- lower the suspension lower arm on a support and compress the suspension spring to fully unload the lower arm;

- disconnect the balljoint housing from the suspension lower and upper control arms and remove the steering knuckle;

- smoothly unload the suspension spring and take it off;

- using pusher 67.7823.9515 knock out the shaft and disconnect the suspension lower arm from the crossmember;

- disconnect the upper arm shaft from the crossmember and remove the shaft in assembly with the control arm;

Note. *Before removing the upper and lower arm shafts count the amount of washers on each end of the lower arm shaft and on the fastening bolts of the upper arm shaft, so that to refit them in former places.*

- remove the recoil bumper bracket and the crossmember, as described above;

- using puller 67.7824.9516, press out the balljoint pins from the steering knuckle.

The front suspension components are shown on fig. 4- 7.

The reassembly of suspension units is carried out in reverse sequence. When reassembling the wheel hub, grease the bearing cages with ЛИТОЛ-24 and put a thin layer in the cavity of the steering knuckle between the bearings in the amount of 40 gr in each knuckle.

When refitting the crossmember tie rods, the inner nut should be tightened until the clearance between the washer and the bracket 3 (see fig. 4-6) will be taken up, and the outer one - with torque specified in the appendix.

To avoid wrong force distribution in silent blocks, the arm shaft nuts should be tightened under vehicle static load of 3140N (320 kgf). Then check and adjust the wheel alignment angles and toe-in.

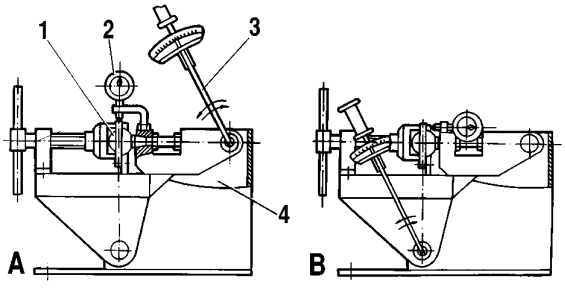

Fig. 4-8. Inspecting the balljoint on fixture 02.8701.9502:
1 - balljoint; 2 - indicator; 3 - dynamometer; 4 - fixture 02.8701.9502; A - method of checking the radial clearance; B - method of checking the axial clearance

Inspection

Balljoint. Ensure the integrity of the balljoint boots; no breaks, cracks, rubber peeling from the metal fixture, traces of grease leaks are permissible.

Check for wear of balljoint working surfaces by manually turning the ballpin. No free play or pin jamming is allowed.

A more profound check of the balljoint radial and axial clearances is carried out on fixture 02.8701.9502. Place the balljoint 1 (fig. 4-8, A) in the fixture bezel and fix with screw. Fit in the fixture bracket indicator 2 so that the indicator leg will rest against the side surface of the balljoint housing, the indicator arrow should point to zero.

Fit the dynamometer 3 in the fixture bezel and apply torque of 196 N•m (20 kgf•m) in both directions, determine by indicator 2 the total radial clearance in the balljoint. If it exceeds 0.7 mm - renew the joint.

Make the similar check of the balljoint axial clearance, previously having changed its fastening in the fixture, as shown on fig. 4-8, B. The axial clearance in the joint should not exceed 0.7 mm.

Suspension springs. Carefully examine the springs. If any deformations affecting the spring efficiency will be found - renew the springs.

To check the spring set down, fully compress it three times. The spring compression is made along the spring axis; the bearing surfaces should meet the vehicle suspension spring seats. Then apply load of 6.276 N (640 kgf). According to the spring length (see fig. 4-9) under the specified load the springs are divided into two classes: class A - length more than 192 mm, and class B - length is equal to or less than 192 mm. The springs of A class can be not marked or have marks with white paint on the external side of coils, spring of B class are marked with black paint.

On the front suspension the springs of the same class, as those on the rear suspension, should be installed. As an exception, when on the rear suspension the springs of B class are installed, and there are no springs of the same class available for

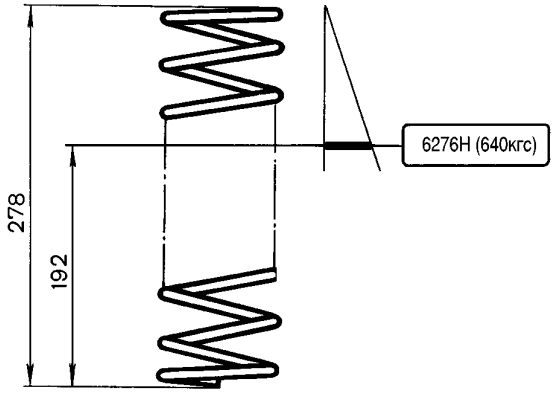

Fig. 4-9. Main parameters for checking the front suspension coil spring

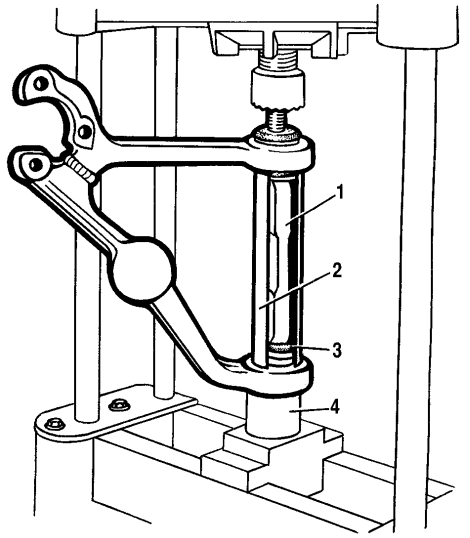

Fig. 4-10. Pressing out the upper control arm balljoint:
1 - control arm shaft; 2 - tool 67.7823.9527; 3 - balljoint; 4 - tool A.47045

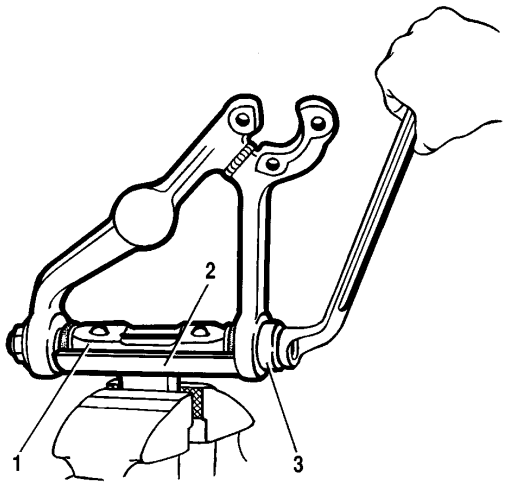

Fig. 4-11. Press-fitting the upper control arm balljoint:
1 - control arm shaft; 2 - tool 67.7853.9519; 3 - fixture A.74177/1

the front suspension, it is permissible to install the A class springs on the front suspension. But you can not install the B class springs on the front suspension, if the A class springs are installed on the rear suspension.

Inspect the gaskets and renew, if they have damages.

Anti-roll bar, suspension arms, steering knuckle. Check the bar for deformations and ensure that the ends lie in one plane; if deformation is insignificant, the bar can be straightened; at significant deformations - renew the bar.

Carefully inspect and ensure that the suspension arms, crossmember and steering knuckles are not deformed and have no cracks. Renew the specified components in case of cracks and deformations.

Suspension crossmember. Use tool 67.8732.9501 to check the geometrical parameters of the crossmember. At significant deformations of the crossmember, when it is impossible to adjust the front wheel alignment angle with washers, and at satisfactory condition of all other elements, renew the crossmember.

Silent blocks. The criteria for renewal are described in chapter "Front suspension - inspection".

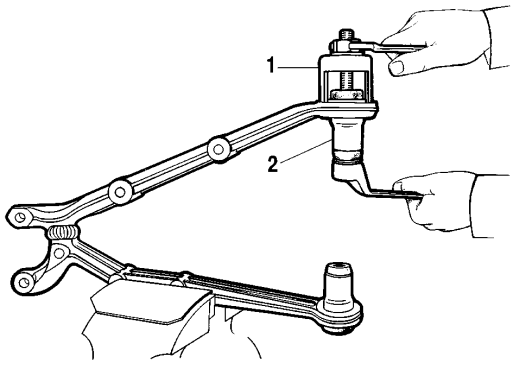

Fig. 4-12. Pressing out the lower control arm balljoint:
1 - tool 67.78223.9517; 2 - balljoint

Replacement of silent blocks

The upper arm. Between the eyes of the arm establish tool 67.7823.9527 on the shaft and place the arm on tool A.47045 (fig. 4-10). Press the arm shaft 1 with the punch to press out joint 3 from the aperture. To press out the second joint turn over the arm and repeat the procedure.

The press fitting of upper arm joints is done with tool 67.7853.9519 (fig. 4-11), fixed in vice. Fix the arm with shaft 1 in fixture 2, place the joint on the shaft and press fit in the arm bezel with tool 3 (A.74177/1). Then repeat the above described operations to press fit the second joint on the other side of the arm.

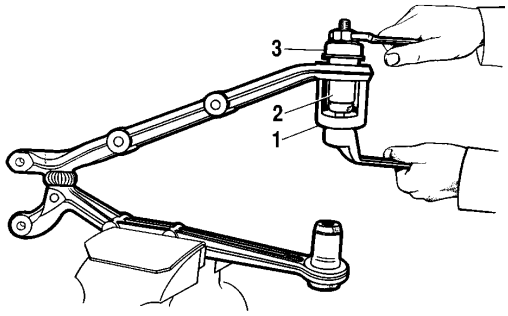

Fig. 4-13. Press-fitting the lower control arm balljoint:
1 - tool; 2 - balljoint; 3 - cap

The lower arm. The pressing-out and press-fitting of the joint can be carried out on a press, using tool 67.7823.9526, and also with tool 67.7823.9517 (fig. 4-12), which is installed on the arm so that the head of the tool screw was directed inside. Tighten the tool screw to press out the joint.

For press fitting, insert the joint into the arm bezel and fit tool 67.7823.9517 (fig. 4-13) complete with cap 3. By tightening the fixture screw, press fit the joint in the arm bezel.

Rear suspension

The design of the rear suspension is shown on fig. 4-14.

Suspension removal and refitting

Removal. Lift the rear part of the vehicle and place it on supports. Take off the rear wheels.

Disconnect the propeller shaft from the final drive gear flange.

Disconnect the hose of the brake hydraulic system from the steel tube on the axle, and make arrangements to prevent liquid leaking from the brake system.

Disconnect the handbrake rear cable brackets from the body, remove the front cable return spring, and after undoing the locknut and the adjusting nut, release the rear cable. Disconnect from the bracket on the axle beam the tie-rod 13 (see fig. 4-14) of the rear brake pressure regulator drive. Disconnect the top ends of shock-absorbers 25.

Put under the rear axle beam a hydraulic jack. Disconnect the longitudinal 3 and 17 and transverse 24 arms from brackets on the body, lower the jack and remove the axle.

Start to dismantle the suspension:

- remove the shock-absorbers from the brackets on the axle beam;

- disconnect the longitudinal and transverse arms from the brackets on the axle beam.

The rear suspension components are shown on fig. 4-15.

The rear suspension refitting is carried out in reverse sequence. On the rear suspension the springs of the same class, as on the front suspension, should be installed. In exceptional cases, if the springs of A class (not marked or with marks by white paint on the external side of coils) are installed on the front suspension, and there are no springs of the same class available

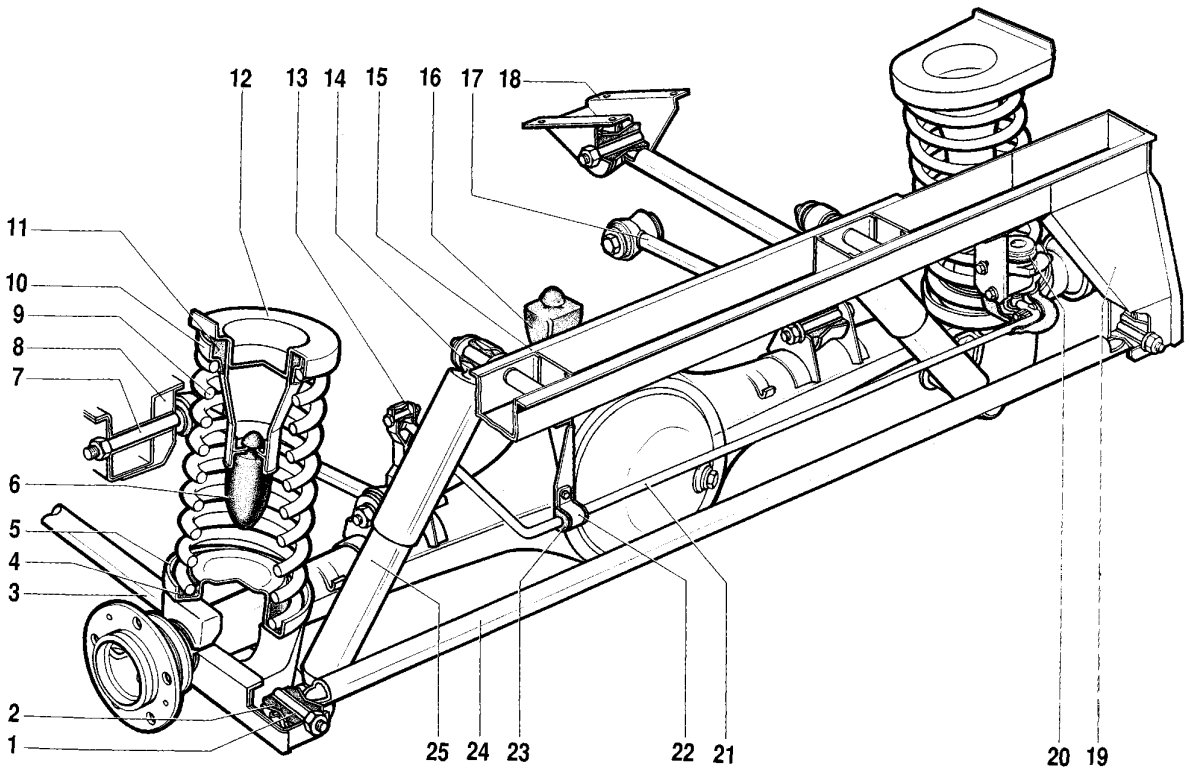

Fig. 4-14. Rear suspension:
1 - spacer sleeve; 2 - rubber bush; 3 - lower longitudinal arm; 4 - spring insulating gasket, lower; 5 - spring seat, lower; 6 - compression buffer; 7 - upper longitudinal arm securing bolt; 8 - upper longitudinal arm mounting bracket; 9 - suspension spring; 10 - upper spring seat; 11 - spring insulating gasket, upper; 12 -spring mounting; 13 - rear brake pressure regulator operating rod link; 14 - shock absorber eye rubber bush; 15 - underbody crossmember; 16 - additional compression buffer; 17 - upper longitudinal arm; 18 - lower longitudinal arm mounting bracket; 19 - transverse arm-to-body mounting bracket; 20 - pressure regulator; 21 - pressure regulator operating rod; 22 - bush clamp; 23 - arm bush; 24 - transverse arm; 25 - shock absorber

for the rear suspension, it is permissible to install the B class springs (with black marking). If on the front suspension the springs of B class are installed, the rear suspension should be fitted with B class springs only.

To avoid damage and excessive tightening of control arm rubber bushes and shock-absorbers:

- load the rear part of the vehicle so that distance **X**, measured from the axle beam to the body chassis arm in 100 mm from the cross bar bracket (fig. 4-16), will make 152 mm; use a dynamometer to tighten the nuts on fastening bolts of the longitudinal and cross bars , and the shock-absorbers fastening pins on the axle beam and car body.

Inspection

Before inspection thoroughly wash all components.

Protect the rubber components, bushes and protective covers from solvents.

Springs. Check the tension characteristic of the spring on control points (fig. 4-17), previously having depressed it to bring the coils in contact.

Note. *According to length under load of 3432 N (350 kgf) the springs are divided into two classes: class A - length more than 278 mm, and class B - length equal to or less than 278 mm. The springs of A class can be not marked or have marks with white paint on the external side of coils, and class B - marked with black paint on the external side of the coils.*

Check for spring deformation. If the spring tension does not correspond to the data on fig. 4-17 or the deformation can affect spring efficiency, renew it.

Inspect the spring rubber gaskets; if necessary - renew.

Arms. Check for:

- arm deformation; straighten if possible;

- cracks on rear axle beam brackets and body; overhaul the brackets in case of cracks;

- the arm joint rubber bushes; if necessary - renew, using a set of fixtures 67.7820.9517.

Shock-absorbers

The design of shock-absorbers of front and rear suspensions is shown on fig. 4-18.

Shock-absorbers bench-test

To test the efficiency of the shock-absorber, make an operating diagram check on a dynamometer bench.

The working diagram is made according to the instruction attached to the test-bench, after no less than 5 working cycles, at the shock-absorber liquid temperature of (20±5) °C, the flywheel

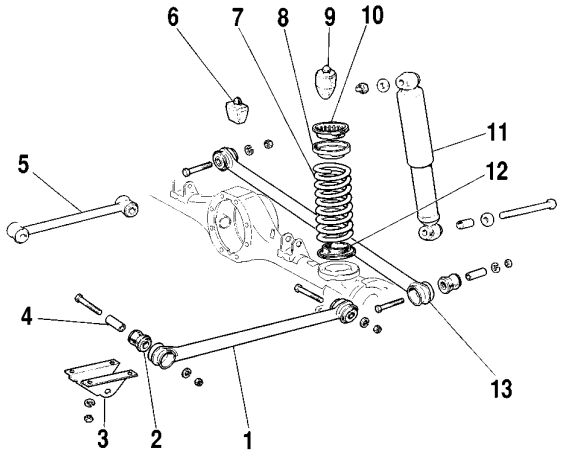

Fig. 4-15. Rear suspension, exploded view:
1 - lower longitudinal arm; 2 - rubber bush; 3 - bracket; 4 - spacer sleeve; 5 - upper longitudinal arm; 6 - additional compression buffer; 7 - spring; 8 - spring seat, upper; 9 - compression buffer; 10 - spring insulating gasket, upper; 11 - shock absorber; 12 - spring insulating gasket, lower; 13 - transverse arm

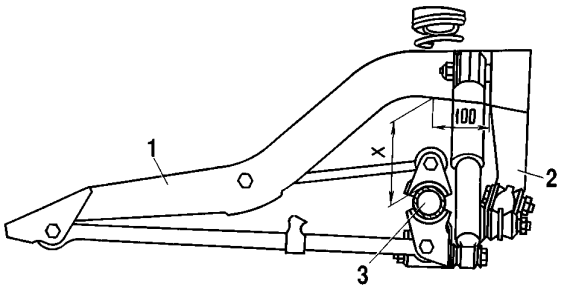

Fig. 4-16. Rear suspension mounting:
1 - chassis arm; 2 - transverse arm bracket; 3 - rear axle beam; X = 152 mm

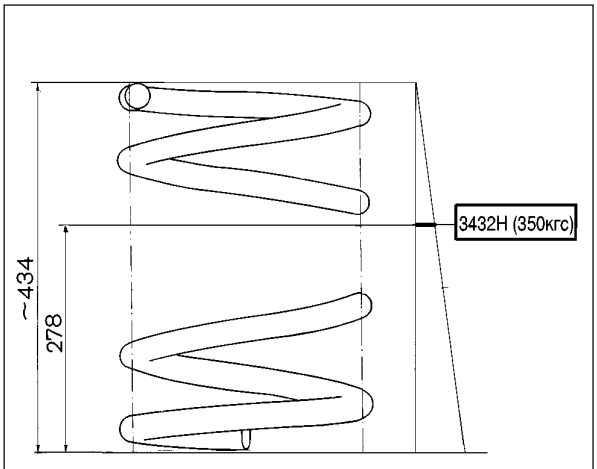

Fig. 4-17. Main parameters for checking the rear suspension spring

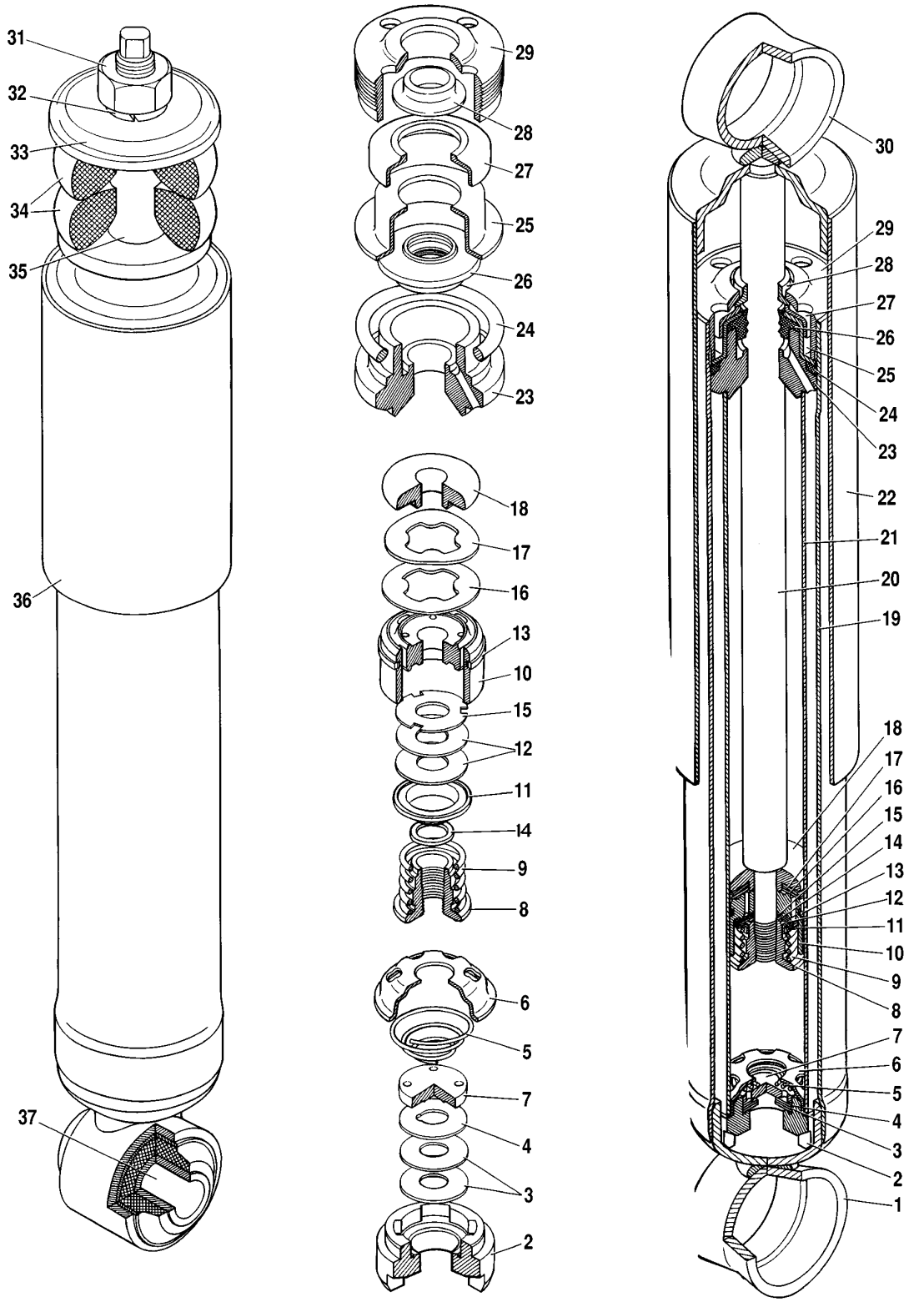

Fig. 4-18. Front and rear suspension shock absorbers:

1 - lower eye; 2 - compression valve body; 3 - compression valve discs; 4 - compression valve throttling disc; 5 - compression valve spring; 6 - compression valve holder; 7 - compression valve cap; 8 - recoil valve nut; 9 - recoil valve spring; 10 - shock absorber piston; 11 - recoil valve cap; 12 - recoil valve discs; 13 - piston ring; 14 - recoil valve nut washer; 15 - recoil valve throttling disc; 16 - by-pass valve cap; 17 - by-pass valve spring; 18 - restricting plate; 19 - tank; 20 - rod; 21 - cylinder; 22 - housing; 23 - rod guide sleeve; 24 - tank sealing ring; 25 - oil seal retainer; 26 - rod oil seal; 27 - gasket; 28 - rod guard ring; 29 - tank nut; 30 - shock absorber eye, upper; 31 - front suspension shock absorber securing nut for top end; 32 - spring washer; 33 -washer; 34 - pad; 35 - distance sleeve; 36 - shock absorber casing; 37 - silent block

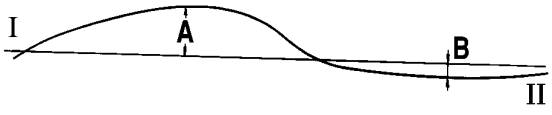

Fig. 4-19. Shock absorber operating curve:
I - force at recoil stroke; II - force at compression stroke

speed of 60 min^{-1}, rod stroke length of 80 mm for the front shock-absorber, and 100 mm - for the rear one.

The curve of the diagram (fig. 4-19) should be smooth, and in points of transition (from the recoil stroke to the compression stroke) - without areas parallel to zero line.

Evaluation of diagram results. The resistance of recoil and compression strokes is defined by the peaks of the appropriate diagrams.

The highest point of the recoil stroke curve, with the scale of 1 mm = 47 N (4.8 kgf), should be on the A distance from the zero line, and equal to: 25-32 mm - for front shock-absorbers, 23.5-30.5 mm - for the rear ones.

The highest point of the compression stroke curve, with the same scale, should be on the B distance from the zero line, and equal to 3.5-6.5 mm - for front shock-absorbers, 4.5-7.5 - for the rear ones.

The ordinate control points on the diagrams of front and rear shock-absorbers are given for cold shock-absorbers at shock-absorber liquid temperature (20±5) °C.

After checking, remove the shock-absorber from the test-bench, overhaul or renew the components if necessary.

Repeat the tests to ensure the shock-absorber efficiency.

Shock-absorber - dismantle and reassembly

After washing fix the shock-absorber in vice.

Note. *Special grips 67.7824. 9513-001 are used to fasten the shock-absorber and its components in vice.*

Fully extend the shock-absorber rod, undo tank nut 29 (see fig. 4-18) with key A.57034/R, take out from the tank the slave cylinder 21 in assembly with the rod and compression valve 2. Remove the tank from vice and drain liquid.

Using key 67.7824.9513-005 take out the rod guide bush 23 from the slave cylinder. Take out from the cylinder rod 20 complete with piston 10 and drain the liquid. Carefully, using a special tool, punch out from the cylinder the compression valve 2 housing in assembly with other components.

Place the rod in assembly with the piston in grips, fix in vice and undo the recoil valve nut 8. Remove piston 10 with valves (bypass and recoil), rod guide bush 23, rod sealing 26, sealing race 25 and other components.

Note. *To facilitate the inspection of the rod in the front suspension shock-absorber it might be helpful to press off the cover from the rod.*

To dismantle the compression valve, first remove race 6, and then sequentially take out from case 2 spring 5, plate 7 and valve discs 4 and 3.

The reassembly of the shock-absorber is carried out in reverse sequence, paying attention to the following:

- after the reassembly of the compression valve ensure the free play of plate 7 and valve discs;

- race 6 is press fitted on case 2 with special tool;

- the compression valve is press-fitted in the cylinder using tool 67.7824.9513-004;

- to facilitate the reassembly of components located on the rod, use guide 67.7824.9513-003;

- the throttle disc 15 of the front shock-absorber has two grooves on the outer diameter, and the rear shock-absorber throttle disc - three;

- the recoil valve nut is tightened with torque of 11.76-15.68 N•m (1.2-1.6 kgf•m);

- the tank nut is tightened with key 67.7824.9513-002 to torque 68.6-88.2 N•m (7-9 kgf•m).

Inspection of components

Wash the metal components and dry, wipe the rubber components with clean cloth and wash in warm water.

Carefully inspect the components, paying attention to the following:

- the compression and feedback valve discs, and the bypass valve plate should not be deformed; the nonflatness of the bypass valve plate is allowed no more than 0.05 mm;

- the working surfaces of the piston, the piston ring, the rod guide bush, cylinder and the valve components should have no scuffings and dents that might affect normal operation of the shock-absorber;

- the recoil and compression valve springs should be tense enough and not damaged ;

- the compression valve discs should not be damaged and should have no significant wear;

- it is recommended to renew the sealing at repair.

Replace all damaged components and start to reassemble the shock-absorber.