

**Open Joint-Stock Company  
"Ulyanovsky Avtomobilny Zavod"**



**AUTOMOBILES  
YA3-31512,  
YA3-31514,  
YA3-31519,  
YA3-3153  
AND THEIR MODIFICATIONS**

**Instruction Manual**

**2001**

This instruction manual contains the brief description of the design and necessary operating and maintenance instructions.

Since efforts are continually made to improve the reliability and performance of the automobiles, minor changes may be introduced without special notice.

We wish You a good trip!

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## IMPORTANT!

*To ensure trouble-free operation of the automobiles, we recommended that You should attentively familiarize yourself with the present publication and follow all the operating and maintenance instructions laid down therein.*

*You can trust the maintenance of your automobile to one of the service stations recommended by the Sellers. These service stations are well stocked with spares, special appliances and tools. All the maintenance operations are performed by experienced specialists.*

### Safety instructions

*1. Before a trip, check the condition of the lock mechanisms of the hood and the body doors.*

*2. When using the low-freezing fluid, leaded gasoline and brake fluid, do the following:*

- avoid any operations which could lead to penetration of these fluids or their steams into the mouth cavity;*
- do not let to dry the liquid which is ocured on the skin, but wash it off right away with warm water and soap;*
- never spill liquids in the interior or indoors. Should spillage occur, wash off the spilled place with water and ventilate it;*
- take off the spilled clothes, wash and dry it outdoors;*
- wet with kerosene the carbon of leaded gasoline when scraping it off to avoid penetrating of toxic particles of carbon into the respiratory organs.*

*3. To avoid scalding, open the radiator cap of the engine cooling system with care.*

*4. Do not warm up the automobile assemblies with free flame.*

*5. Cut out the storage battery after driving and also in case of short circuit of wiring.*

### Precautions

*1. Do not begin driving the automobile with the cold engine. After starting the engine from cold, never run it at a high crankshaft speed.*

*2. Cut in the oil cooler at an ambient temperature above 20 °C,*

*and when riding under hard service conditions (at heavy loads and a high crankshaft speed) depending on ambient temperature.*

*3. Shift the gearbox in the reverse gear and shift the transfer case to low range only when the automobile is stationary*

*4. When descending a steep:*

*- do not shut down the engine to avoid loss of the efficiency of the brakes provided with the vacuum booster;*

*- do not disengage the clutch to avoid breaking of the clutch driven disk.*

*5. When riding on dry hard-surface roads, disengage the front axle. When the front wheels are disengaged, never engage the front axle.*

*6. If one of the hydraulic brake circuits is a failure, the travel of the brake pedal is increased, and the braking efficiency is decreased.*

*7. When driving the automobile equipped with the hydraulic steering booster, it is not recommended to hold the steering wheel at the extreme position for more than 5 s in order to prevent overheating of oil and failure of the hydraulic steering booster pump.*

*8. When using the gun with the unscrewed tip, take out the spring and the ball in order to avoid their falling in the assemblies with liquid grease.*

*9. Avoid falling acids, soda solutions, braking fluids, antifreeze and fuel on the painted surfaces of the body and rubber parts.*

*10. Do not allow impact loads on the chassis of the automobile. When a strong impact of the front wheels is occurred, inspect carefully the wheels, all parts of the front axle, steering rods, steering mechanism, oil sump, eliminate defects, if required.*

*11. To avoid heavy loads on the axle differential, do not allow a prolonged slipping.*

*12. Use the warmth-keeping hood for radiator shell to provide the proper temperature condition for engine at an ambient temperature below 0 °C.*

*13. When the automobile is to be operated at a temperature below -30 °C, do not fail to disengage the front axle.*

*14. The automobile is provided with a towing hook allowing a short-time operation with a trailer. Do not tow a trailer on rugged ground.*

*15. Since efforts are continually made to improve the reliability and performance of the automobiles, minor changes may be introduced without special notices.*

## INTRODUCTION

The automobile YA3-31512 (Fig. 1) - passenger/cargo, with soft open-top four-door body and tail gate, with driving axles without hub drives\*.

The automobile YA3-31514 (Fig. 2) - passenger/cargo, with four-door body, hard top and tail gate, with driving axles without hub drives\*.

The automobile YA3-31519 - passenger/cargo, with four-door body, hard top (Fig. 2) or soft open-top (Fig.1) and tail gate, with driving axles without hub drives\*.

The automobile YA3-3153 (Fig. 3) - passenger/cargo, with four-door body, hard top and tail gate, with driving axles without hub drives\*.

There are two-axle all-wheel drive cross-country vehicles (4x4 wheel arrangement).

The automobiles are designed for transportation of people and loads on roads of all types and intended for operating at ambient temperatures from -45 °C to +40 °C

The automobiles YA3-31519, YA3-3153 are equipped with an engine of uprated power.

## AUTOMOBILE MARKING

**The identity number of the automobile** is indented on the nameplate, on the level flange of the body front upper panel (Fig. 5).

**The nameplate "Identification Data"** is fixed at the central pillar of the r.h. body side (at the aperture of the rear side door).

**The body number** is indented on the level flange of the body front upper panel (under the hood, on the l.h. side).

**The chassis number** is indented on the frame r.h. rear cross-member.

**The engine number** is indented on the l.h. side of the cylinder block (Fig. 6).

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\* Some automobiles could be equipped with the driving axles with the hub drive (Fig. 4)



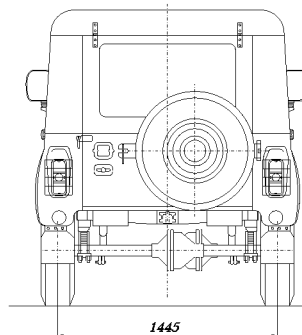
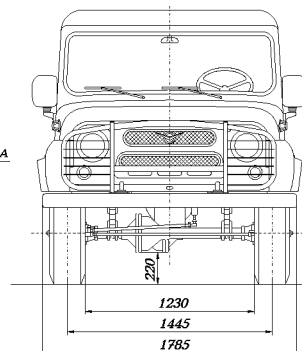
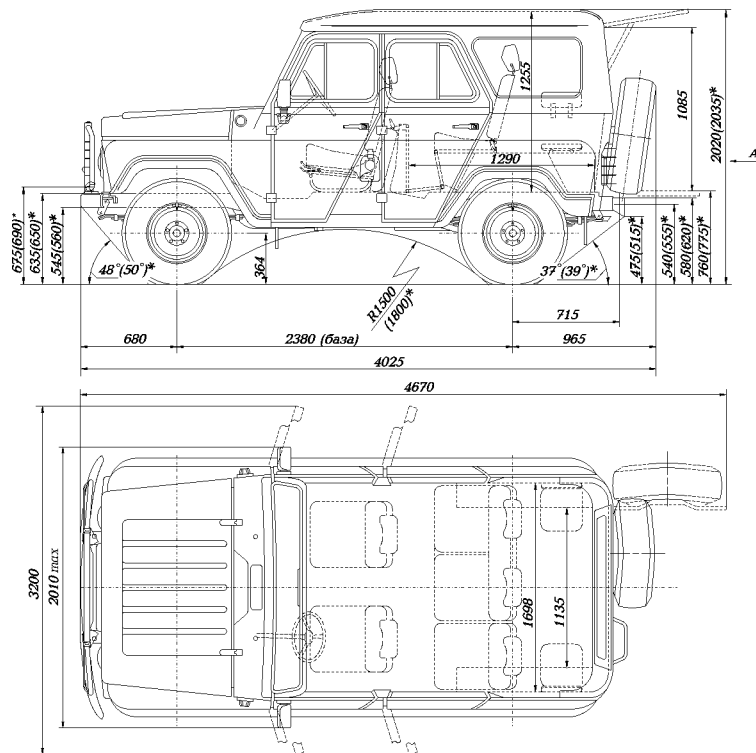
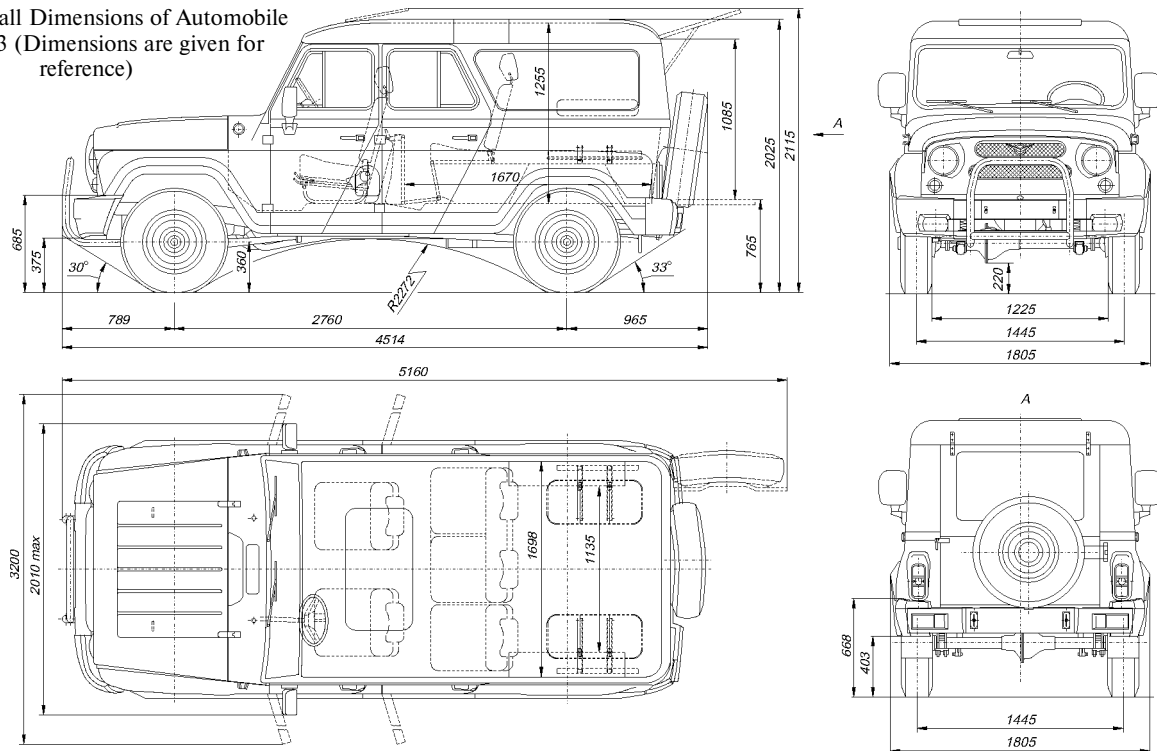


Fig. 2. Overall Dimensions of Automobile YA3-31514 and YA3-31519 (Dimensions are given for reference)

\* For automobiles with front spring suspension

**Note.** Dimensions of automobiles provided with axles with hub drive see in Fig. 4

Fig. 3. Overall Dimensions of Automobile  
YA3-3153 (Dimensions are given for  
reference)





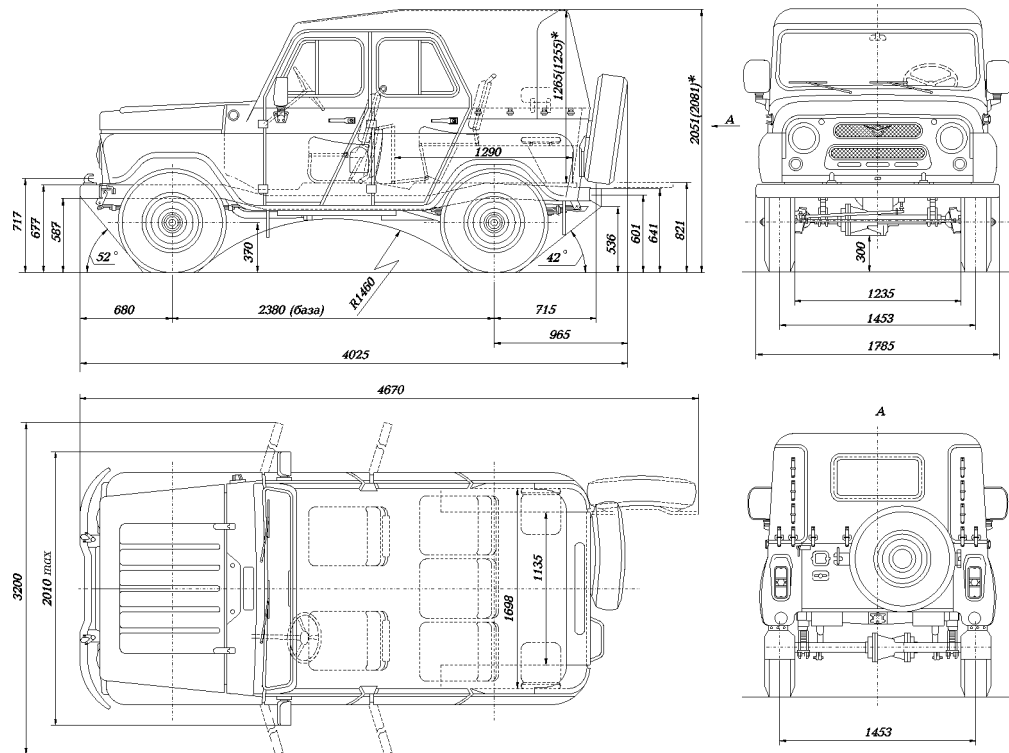


Fig. 4. Overall Dimensions of Automobiles YA3-31512, YA3-31514, YA3-31519 provided with axles with hub drives (dimensions are given for reference)

\* For automobiles with hard top

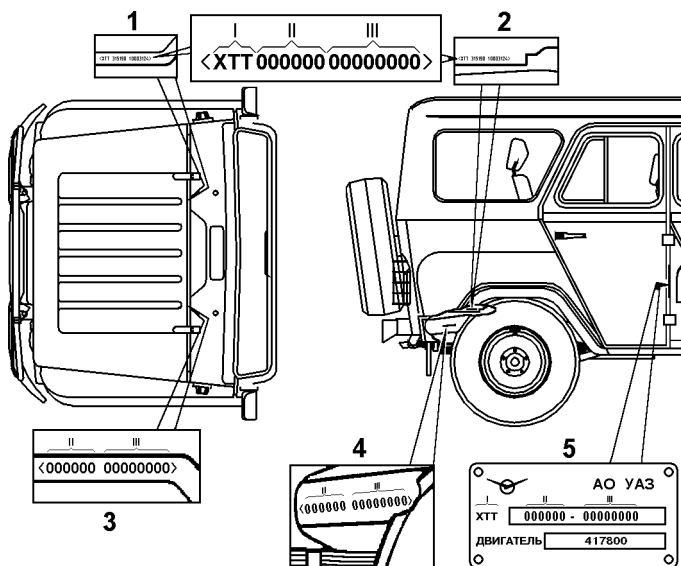


Fig. 5. Automobile Marking:

1, 2 - identity numbers; 3 - body number; 4 - chassis number; 5 - name plate "Identification Data";

I - international code of manufacturer;

II - descriptive part (automobile model, make);

III - indicating part (year of automobile manufacture and ordinal number)

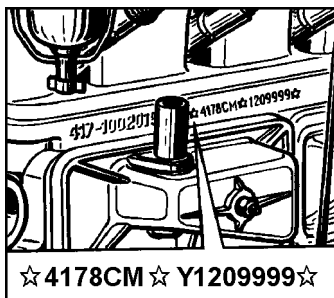


Fig. 6. Location of Engine Number

## SPECIFICATIONS

Description	Automobile Models			
	YA3-31512	YA3-31514	YA3-31519	YA3-3153
1	2	3	4	5

### GENERAL DATA

Overall dimensions of automobiles are given in Fig. 1-4

Automobile type	two-axle all-wheel drive crosscountry vehicle (4x4 wheel arrangement)			
Seating capacity	7			9
Load capacity (driver and passengers included, kg)	750 - when riding on improved roads 550 - other roads and country roads			800
Gross weight, kg:				
with soft top	2350	-	2350	-
with hard top	-	2500	2500	2600
Gross weight distribution, kg:				
front axle:				
with soft top	965	-	965	-
with hard top	-	1000	1000	1080
rear axle:				
with soft top	1385	-	1385	-
with hard top	-	1500	1500	1520
Vehicle total weight, kg:				
with soft top	1600	-	1600	-
with hard top	-	1750	1750	1800
Vehicle total weight distribution:				
front axle :				
with soft top	880	-	880	-
with hard top	-	950	950	930
rear axle:				
with soft top	720	-	720	-
with hard top	-	800	800	870
Maximum speed, km/h	110	110	120*	120
Permissible total tow weight, kg:				
with brakes		1500**		
without brakes		750**		

\* Maximum speed should be not more 110 km/h when the tyres Я-245-1 are installed.

\*\* To tow a trailer at all times and on rugged ground is allowed only when the automobile is equipped with a towing gear of the ball type.

1	2	3	4	5
Minimum turning radius by track of front outer wheel (relative to centre of turn), m, not more	6.3 (6.5*)			7.2
Outer turning radius by point of front bumper max. removed from centre of turn, m, not more	6.8 (7.0*)			7.6
Maximum upgrade of full laden automobile, deg.	31			
Maximum depth of ford, m without preparation	0.5			
with preparation	0.7			
ENGINE				
Model	4178		4218	
Type	4-stroke, carburettor-type			
Cylinder number	four			
Cylinder order	in-line, vertical			
Firing order	1-2-4-3			
Cylinder bore, mm	92		100	
Piston stroke, mm	92		92	
Displacement, l	2.445		2.89	
Compression ratio	7.0		7.0	
Nominal power at crankshaft speed of 66 s <sup>-1</sup> (4000 min <sup>-1</sup> ) kW (hp)				
to DIN 70020	57.4 (78)		63.2 (86)	
gross to SAEj 816b	68.4 (93)		73.5 (100)	
net to ГOCT14846	55.9 (76)		61.8 (84)	
Maximum gross torque at 36-42 s <sup>-1</sup> (2200-2500 min <sup>-1</sup> ) N · m (kgf · m):				
to DIN 70020	164.8 (16.8)		193 (19.7)	
gross to SAEj 816b	174.6 (17.8)		201 (20.5)	
net to ГOCT 14846	159.8 (16.3)		189 (19.3)	
Minimum low idle speed of crankshaft, s <sup>-1</sup> , (min <sup>-1</sup> )	11.6-12.5 (700-750)			
Engine lubrication system	Combination: forced and splash			
Crankcase ventilation	Closed			

\* When the axle with hub drive is installed

1	2	3	4	5
Fuel system	With forced fuel feed and fuel-air mixture heating			
Fuel	Gasoline with octane number 76			
Cooling system	Liquid, closed, forced circulation			
POWER TRAIN				
Clutch:	Dry, single-disk			
Type of clutch	Hydraulic			
Type of drive	Four-speed			
Gearbox	Four-speed			
gear ratios	1st speed....3.78	3rd speed ... 1.55		
	2nd speed...2.60	4th speed.....1.00		
	Reverse.....4.12			
Optional version of gearbox:				
gear ratios	1st speed...4.124	3rd speed .....1.58		
	2nd speed...2.641	4th speed.....1.00		
	Reverse.....5.224			
Transfer box	Two-range			
gear ratios:				
high range	1.00			
low range	1.94 or 1.47			
Front and rear driving axles	Final drive - spiral bevel gearing; gear ratio 4.625*			
front axle steering knuckle joints	Constant-velocity universal joints of ball type			
CHASSIS				
Suspension:	on four longitudinal semielliptic springs **			front -
type				spring with transverse stabilizer;
				rear - on small-leaf springs

\* The automobiles YA3-31512, YA3-31514, YA3-31519 could be equipped with Π-shape axles with hub drive:

Hub drive:	gear, spur internal gears
Gear ratio of hub drive	1.94
Gear ratio of final drive	2.77
Total gear ratio	5.38

\*\* Some models of automobiles YA3-31512, YA3-31514 and YA3-31519 are equipped with front spring suspension with transverse stabilizer and rear small-leaf springs.

1	2	3	4	5
Wheels and tyres: wheels	Steel, with deep-well one-piece rim, size 6L×15 or 6J×16 depending on tyres in use			
tyres	Tubed 225R16C (K-151 or K-152), 225/75R16 108Q (K-153), 225/75R16 (Я-435A) 215/90-15C (Я-245-1), 215/90R15C 99N (ЯИ-357A)			
Tube size	8,40-15 or 225-16 depending on tyres in use			
CONTROL SYSTEMS				
Steering arrangement:	Safe, steering shaft - split, with cardan joint			
type of steering mechanism	hourglass worm	Screw-ball nut-sector with or without hydraulic steering booster		
	with two comb roller*	or without steering booster		
mean gear ratio of steering mechanism	20.3	with hydraulic steering booster.....17.3 without hydraulic steering booster.....20.5		
Brakes:				
Service	Shoe, with two separate circuits actuated from two-chamber master cylinder			
parking	Drum with inner shoes acting on power train, with mechanical drive			
ELECTRICAL EQUIPMENT				
Wiring	Single-wire, with ground returned minus			
Rated voltage, V	12			
Overload breakers:				
fuse	Unit, provided with three fuses 10A each in circuits of horn, warning lights and instruments Fuse in circuit of cigarette lighter, 16A Fuse in circuit of heater motor, 6A			

\* Some automobiles YA3-31512 could be equipped with steering mechanism of type "screw-ball nut-sector" with or without hydraulic steering booster

1	2	3	4	5
thermal cut-out	Pushbutton - in lighting circuit			
	<b>ADJUSTMENT DATA</b>			
Valve-to-rocker clearance on cold engine (at 15-20 °C), mm: for exhaust valves of No.1 and No. 4 cylinders for the rest of valves		0.30-0.35 0.35-0.40		
Deflection of fan and hydraulic steering booster belts when: force of 4 kgf is applied, mm		8-14		
Cooling fluid density at 20 °C, g/cm <sup>3</sup> : ОЖ-40 "Лена" ОЖ-65 "Лена"		1.075-1.085 1.085-1.100		
Cooling fluid temperature in cooling system, °C		80-90		
Spark plug gap, mm		0.85 <sup>+0.15</sup>		
Free travel of clutch pedal, mm		35-55		
Free travel of brake pedal, mm		5-14		
Front wheel toe-in, mm		1.5-3.0		
Maximum turning angle of front inner wheel, deg		27		
Steering wheel play, deg, not more		10		

#### **Tyre Inflation Pressure, kPa (kgf/cm<sup>2</sup>)**

	Tyre Model		
	Я-245-1	ЯИ-357А	К-151, К-152, К-153, Я-435А
Front wheel:			
YA3-31512, YA3-31514			
YA3-31519	1.7 (1.7)	1.9 (1.9)	1.9 (1.9)
YA3-3153	-	-	2.0 (2.0)
Rear wheel:			
YA3-31512, YA3-31519 with soft top	2.2 (2.2)	2.4 (2.4)	2.4 (2.4)
YA3-31514, YA3-31519 with hard top	2.5 (2.5)	2.6 (2.6)	2,6 (2,6)
YA3-3153	-	-	2,6 (2,6)

### FILLING CAPACITIES, l

Description	Automobile Models			
	YA3-31512	YA3-31514	YA3-31519	YA3-3153
Fuel tanks:				
r.h.			39	
l.h.			39	
Engine cooling system (heater and expansion tank including)			12.5-12.7	
Engine lubrication system			5.8	
Gearbox			1.0	
Transfer box			0.7	
Final drive casing (each)			0.85	
Steering gear case	0.25		0.5 (1.1)*	
Shock absorbers (each)			0.320	
Hydraulic actuated brake system			0.52	
Clutch hydraulic system			0.18	
Windshield washer reservoir			2	

### CONTROLS AND INSTRUMENTS

Arrangement of the controls and instruments is illustrated in Fig. 7:

- 1 - steering wheel.
- 2 - rear view mirror (internal).
- 3 - instrument panel.
- 4 - sun visors.
- 5 - windshield wiper blades.
- 6 - windshield demisting nozzle.
- 7 - passenger grab handle.
- 8 - light (mounted on automobile YA3-31512).
- 9 - ground switch .
- 10 - front driving axle control lever: the forward lever position - the front axle is engaged (Fig. 8).

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\* For steering mechanism with hydraulic steering booster



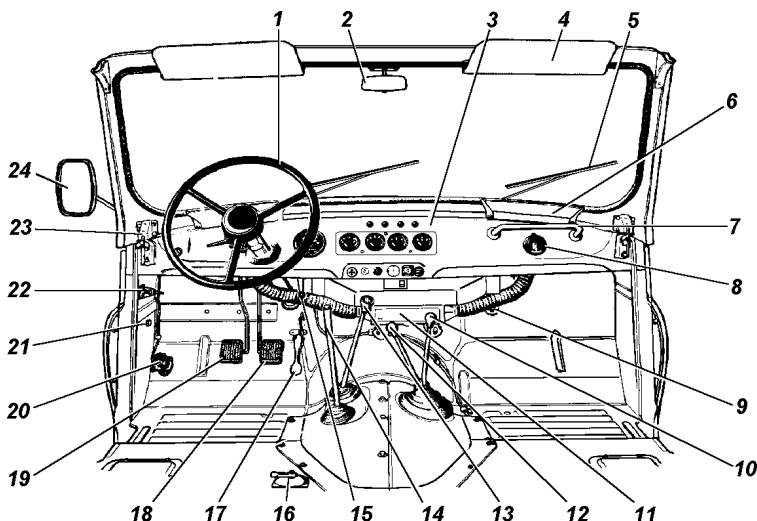


Fig. 7. Controls and Instruments (for Ref. Nos. refer to text)

11 - heater box cover: when the cover is open the hot air flows into the compartment.

12 - transfer box shift lever: the forward lever position - direct range - ON, the intermediate position - neutral, the backward position - low range ON.

13 - gearshift lever: directions for moving the lever for shifting in the gears are indicated on the handle of the gearshift lever and in Fig. 8.

14 - parking brake lever.

15 - heater and ventilator lid control handle.

Fig.8. Instruction Plate.  
Positions of Transmission,  
Transfer Case and Front Axle  
Shift Levers:

1 - positions of shift levers; 2 - transmission; 3 - transfer case; 4 - speed ranges; 5 - high range; 6 - neutral; 7 - low range; 8 - front axle; 9 - engaged; 10 - disengaged; 11 - when driving on dry hard-surface roads, do not fail to disengage the front axle



16 - handle of fuel tank cock: turned to the right - the right-hand fuel tank is on; turned forward - the cock is closed; turned to the left - the left-hand fuel tank is on.

17 - accelerator pedal.

18 - service brake pedal.

19 - clutch pedal.

20 - foot-operated dimmer switch: by pressing the button, when the lights are on, the lower beam or upper beam will be on. (mounted on the automobile YA3-31512).

21 - receptacle

22 - radiator shutters control handle: the radiator shutters are closed when the handle is pulled out towards yourself.

23 - window frame lock.

24 - rear-view mirror (external).

The instrument panel is illustrated in Fig. 9, 10, 11, wherein:

1 - flasher warning system button switch.

2 - speedometer with trip odometer indicating the automobile speed in km/h, and trip odometer indicating the total run of automobile in km.

3 - fuel level gauge. Each tank is provided with a fuel level gauge.

4 - brake emergency condition warning lamp (red).

5 - parking brake warning lamp (red).

6 - turn indicator warning lamp (green).

7 - radiator cooling fluid emergency overheating warning lamp.

8 - upper beam warning lamp (blue).

9 - engine cooling fluid temperature gauge

10 - emergency oil pressure warning lamp.

11 - oil pressure gauge

12 - voltmeter indicating voltage in automobile mains

13\* - cigarette lighter.

14 - light (on automobiles YA3-31514, YA3-31519, YA3-3153 dome light is mounted ).

15 - dome light switch (dome light switch of automobiles YA3-31514, YA3-31519 is located near by the dome light).

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\* Installed on some automobiles

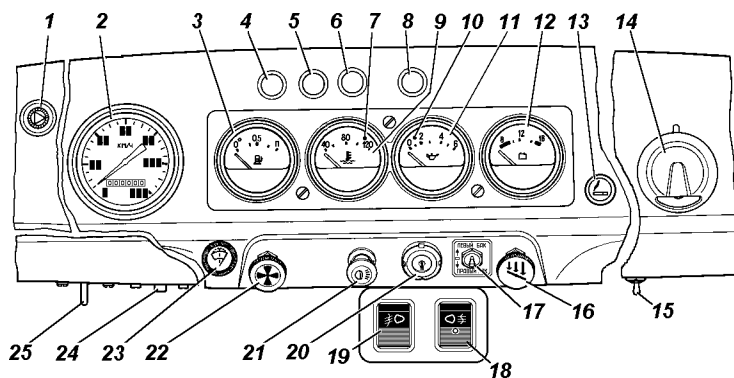


Fig. 9. Instrument Panel of Automobile YA3-31512 (for Ref. Nos. refer to text)

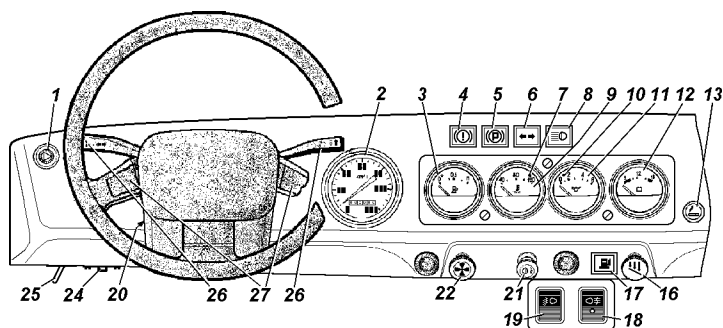


Fig. 10. Instrument Panel of Automobiles YA3-31514, YA3-31519 (for Ref. Nos. refer to text)

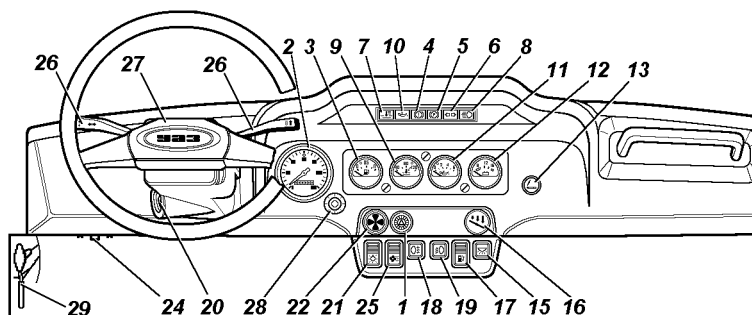


Fig. 11. Instrument Panel of Automobile YA3-3153 (for Ref. Nos. refer to text)

16 - throttle valve control knob. The knob can be fixed by turning it through 90° in any direction.

17 - selector switch of fuel level gauges.

18 - rear fog switch.

19\* - fog lamps switch.

20 - combined ignition and starter switch (see Fig. 12 and 13).  
The ignition key should be removed only when it is in the position III, thereby the interlock device mechanism engages and locks the steering gear shaft.

To lock the steering gear when parking, put the key in the position III, take it out and rotate the steering wheel in any direction till click is heard; this means that the lug of the interlock device is in register with the recess of the stop-bush of the steering wheel shaft. To unlock the steering gear, insert the key into the ignition switch, and by turning the steering wheel to the left and to the right, turn the key clockwise to the position I.

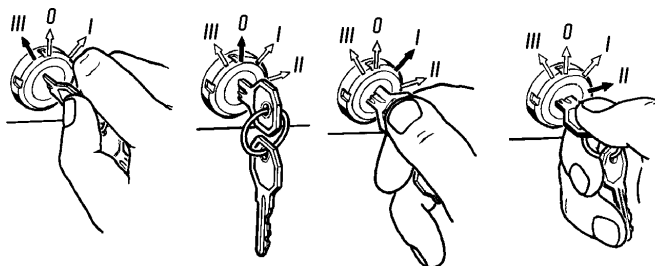


Fig. 12. Position of Ignition Key of Automobile YA3-31512:

0 -neutral;

I -ignition ON;

II -ignition and starter ON;

III -radio ON (if available)

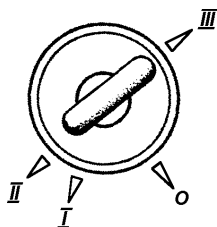


Fig. 13. Position of Ignition Key of Automobiles  
YA3-31514, YA3-31519, YA3-3153:

0 -all OFF (fixed position);

I -ignition ON (fixed position);

II -starter ON (non-fixed position);

III -parking (fixed position)

\* Installed on some automobiles

An interlock device provided in the ignition switch eliminates the starter faulty switching at operating engine and permits to restart the engine only when the key has been returned to the position 0.

*It is not allowed to switch the ignition and remove the key out of the ignition switch during motion. The engine stop furthers the loss of the braking effect, and when the ignition key is removed out, the steering gear shaft is locked by means of the antitheft device, and the automobile could be not steered.*

21 - outer light switch (Fig. 9, 10, 11) has three positions: the first - all lights are OFF; the second - clearance lights are ON; the third - clearance lights and lower or upper beam are ON (depending upon knob position). On automobiles YA3-31512, YA3-31514, YA3-31519, intensity of instrument panel lighting is adjusted by rotating the light switch knob.

22 - choke valve control knob. The knob can be fixed by turning it through 90° in any direction.

23 - windshield wiper and washer selector switch (installed on the automobile YA3-31512). The windshield wiper is switched on by rotating the switch knob and the windshield washer is switched on by depressing the knob axially.

24 - pushbutton of lighting circuit thermal cut-out.

25 - heater fan electric motor selector switch has three positions: OFF, fan motor low speed ON, fan motor high speed ON.

26 - multifunctional switches levers (for Ref. Nos. refer to Fig. 14). The turn indicator switch is mounted on the automobile YA3-31512.

27 - horn buttons

28 - instrument lighting switch. When outer lighting is on, instrument panel lighting could be switched on and its intensity could be adjusted by rotating the knob.

29 - hood lock lever

## Seats

The front seats of the automobile YA3-31512 (Fig. 15) are interchangeable, each seat is attached to the floor with three bolts and be set into one of three positions. Seat backs of the front seats may be set in one of two possible positions. (Avoid setting the seats and seat backs in the extreme rearward position, as it would hinder to fold the triple seat).

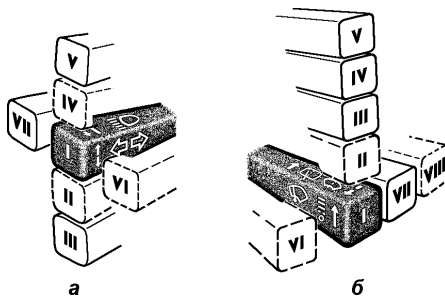


Fig. 14. Multifunctional Switches Located under Steering Wheel of Automobiles YA3-31514, YA3-31519, YA3-3153:

a - turn indicator and headlamp handle has the following positions:

I - turn indicators are off; low beam is on if the headlamps are switched on by means of the outer light switch;

II - l.h. turn indicators are on (non-fixed position);

III - l.h. turn indicators are on (fixed position);

IV - r.h. turn indicators are on (non-fixed position);

V - r.h. turn indicators are on (fixed position);

VI (to himself) - upper beam is on independent upon the position of main light switch (non-fixed position);

VII (from himself) - upper beam is on, if headlamps are switched on by means of main light switch (fixed position).

b - windshield wiper and washer switch handle has the following positions:

I - windshield wiper and washer are switched on;

II - windshield wiper operates in intermittent mode (non-fixed position);

III - windshield wiper operates in intermittent mode (fixed position);

IV - windshield wiper operates in constant mode (slow speed) (fixed position);

V - windshield wiper operates in constant mode (high speed) (fixed position);

VI (to himself) - windshield wiper and washer are switched on (non-fixed position);

VII, VIII - not in use

The automobiles YA3-31514, YA3-31519, YA3-3153 and some automobiles YA3-31512 are equipped with the front seats with the height-adjustable headrests (Fig. 16). To adjust the seats in longitudinal direction, turn down the lever 1, move the seat and lower the lever. The backrest is adjusted by rotating the knob 2. As a version, the seat could be provided with a waist support mechanism which permits to choose the most comfortable position of the seat. The seat could be adjusted by rotating the knob 3.

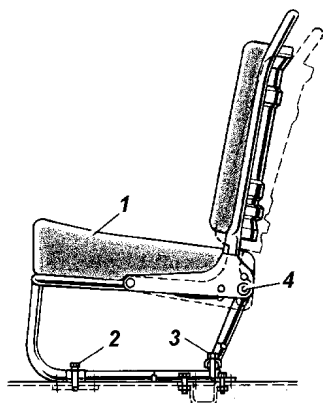
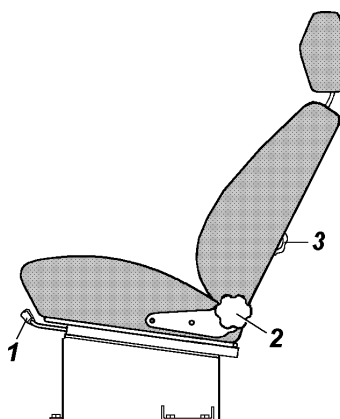


Fig. 15. Front Seats of Automobiles  
YA3-31512

1 -seat; 2 -front attachment bolt; 3 -rear attachment bolt; 4 -seat back attachment bolt for tilt adjustment

Fig. 16. Front Seat of Automobiles  
YA3-31514, YA3-31519, YA3-3153:

1 -seat longitudinal movement adjusting lever; 2 -seat back tilt adjusting knob; 3 -waist support adjusting knob



The rear triple seat (Fig. 17) is of a folding type and has two separate seat backs (on the automobiles YA3-31514, YA3-31519, YA3-3153 the seats are provided with headrests). To fold the triple seat:

- remove the headrests;
- unfasten the safety belt attachment of the rear seat (refer to the section "Safety Belts" below);
- release the back locks by pulling the handle 8 of the lock, tilt the backs to the seat cushions and fasten them in this position;
- turn the seat on pivots of the seat legs and hinge it out forward (unscrew the fly nuts 10 (Fig. 17a) and unfasten the seat locks by pulling the lever 9 on automobiles YA3-3153). Such a position makes it possible to enlarge the cargo area of the body.

The rear single seats (Fig. 18) are provided with a separate back and cushion. The back is secured unmovable to the body side panels, the cushion may be hinged out upward and secured by straps. In the service position the single seat cushion are fixed by pins in rubber sockets. The automobiles YA3-3153 are equipped with the side double seats.

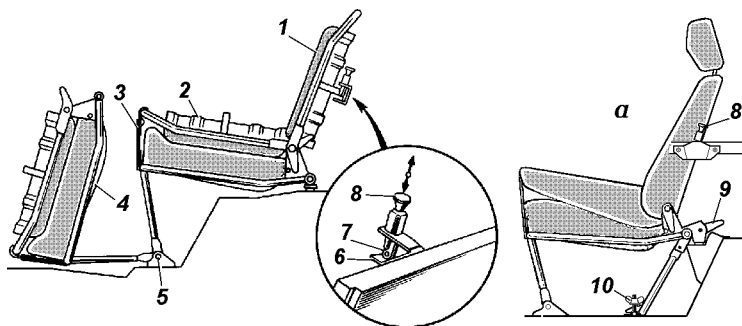


Fig. 17. Triple Seat:

a -seat of automobile YA3-3153;

1 -seat back in service position; 2 - seat back in folded position; 3 -belt to fasten seat back to cushion; 4 -seat in reclined position; 5 -seat frame leg pivot; 6 -side lock bracket; 7 -buffer; 8 -lock handle; 9 -seat lock handle; 10 -fly nut

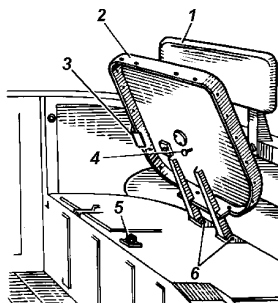


Fig. 18. Side Single Seat:

1 -seat back; 2 -belt to fasten cushion ; 3 -seat cushion; 4 -pin to lock cushion in service position; 5 -cushion pin seat; 6 -cushion attachment pivots

Some automobiles could be equipped with the longitudinal semihard seats instead of the triple seat and two rear single seats.

## Safety Belts

The automobile is equipped with safety belts for all seats, except for the rear side seats .

The safety belts of the front seats and the side safety belts of the rear seat are diagonal lap belts provided with a length manual adjuster (on the automobile YA3-3153 are fitted diagonal lap belts with an automatic retractor), the middle safety belt of the rear seat is the lap belt provided with a length manual adjuster.



To fasten the belt, pull the tongue 1 (Fig. 19) and insert it into the lock 2 till click is heard. To unfasten the belt, push the button 3.

When adjusting length of the belt without retractor, the palm should pass freely between the chest and the diagonal belt, and the waist belt should fit closely to the hips.

When adjusting length of the rear seat middle belt, the belt should fit closely to the hips.

Do not fasten a child sitting on the knees of a passenger.

The belts could be washed with suds. Do not iron the belts.

Replace the shabby and damaged belts and the belts after emergency loading as a result of an accident.

When folding the rear seat of the automobiles YA3-31512, YA3-31514, YA3-31519, unfasten the locks 4 (Fig. 19 "a") and pull the belts. The rear seat belts are provided with a body floor instant-release attachment (Fig. 19 "6"). To unfasten the belt, turn its tongue through 90° and take it from the bracket slot.

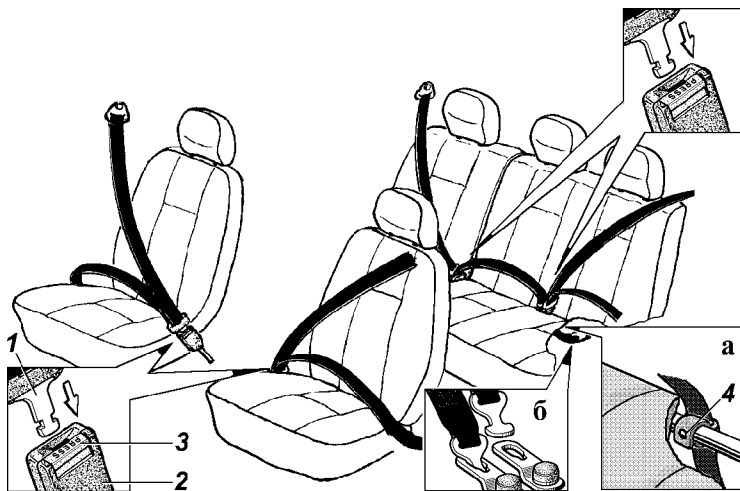


Fig. 19. Safety Belts of Automobiles:  
a - for YA3-31512, YA3-31514, YA3-31519; 6 - for YA3-31513;  
1 -tongue; 2 -lock; 3 -lock button; 4 -button

## **PRESTARTING PROCEDURE**

Dealers must give your automobile a Free Service inspection laid down in the service book.

Before driving automobiles from the Manufacturer to Distributors/Dealers, it is necessary to carry out all the operations laid down in the section "Daily Maintenance".

## **AUTOMOBILE RUNNING-IN**

The automobile service life depends to a greater extent on the operating mode during the initial service period. During this period, it is necessary to pay much attention to the special maintenance of the automobile. The running-in kilometrage is equal to 1000 km.

**During the running-in period, observe the following rules:**

1. Do not overload the automobile.
2. Do not move on hard-surfaced roads (deep mud, sandy soils, steep up-grades etc.)
3. Do not exceed the following speed limits:  
in direct gear ..... 45-50 km/h;  
in the third gear..... 30 km/h;  
in the second gear ..... 20 km/h;  
in the first gear ..... 12 km/h.
4. Do not change oils filled in the engine and units at the manufacturing plant.
5. Check the temperature of brake drums and in case of raising the temperature, adjust them in compliance with the instructions laid down in the section "Brakes".
6. Check the temperature of wheel hubs and in case of raising the temperature, loosen the tightness of bearings.
7. Check condition of all attachment. Check the connections of pipes; if oils, fuel, coolant and hydraulic fluids leak, eliminate defects.

## **STARTING AND SHUTTING DOWN THE ENGINE**

### **Starting the Engine**

Before starting the engine, check the coolant level in the engine cooling system, fuel level and oil in the engine crankcase.

Prime the carburettor by means of the fuel pump hand primer.

**Starting from Cold at 0 °C and Above.**

Shift the gearshift lever in the neutral.

Press the throttle valve control pedal (the accelerator pedal) several times.

Disengage the clutch and switch on the ignition and the starter. Switch on the starter for 5 s maximum. Intervals between starting attempts should be at least 10-15 s.

(It is not recommended to switch on the starter for more than three times in succession, stop starting, check the engine, detect and eliminate defects.)

As soon as the engine is started, immediately release the key. Warm up the engine. The temperature of coolant must be not less than 60 °C.

It is forbidden to increase a crankshaft speed for warming-up the engine.

**Starting from Cold at Temperature Below - 20 °C.**

Before starting the engine, carry out the following operations:

1. Close the radiator shutter and mount the radiator shell warmth-keeping cover.
2. Using the starting handle, turn over the engine crankshaft for 3-5 times.
3. Pull the choke control knob all the way out (preliminary, the throttle valve control pedal should be pressed).

Carry out the subsequent operations in the order specified for starting the engine at temperatures of 0 °C and above.

After the engine is warmed up, push the choke control knob all the way in.

**Starting from Cold at Temperature Below - 20 °C.**

Before starting the engine at a low temperature, warm it up (by means of hot water, steam or air etc.).

Before starting the engine, it is recommended to warm up the transistor commutator, for this purpose switch on the ignition, and start the engine in 3 minutes.

Carry out the subsequent operations in the order specified for starting the engine at temperatures of 0 °C to -20 °C.

**Starting from Hot.**

When starting from hot, do not push the choke valve control knob in, and the throttle valve control pedal is not be sharply

depressed, as it results in overenrichment of the air-fuel mixture, and the engine fails to be started.

To eliminate the overenrichment, blow through the engine cylinders with air for which purpose smoothly depress the throttle valve control pedal up to the toeboard, and immediately turn over the crankshaft by means of the starter for several times.

### **Shutting down the engine**

Before shutting down the engine, let it run for 1-2 minutes at a low crankshaft speed for gradual and uniform cooling and thereafter switch off the ignition.

## **FEATURES OF DRIVING UNDER DIFFERENT ROAD, METEOROLOGICAL AND CLIMATIC SERVICE CONDITIONS**

The operation and service of automobile depends to a greater extent on features of its driving. When driving correct, the automobile could run at a high middle speed and consume not much fuel when overcoming almost impassable sections of roads. **We recommend to shift in the second gear for starting the automobile away from rest on level sections of roads or on down-grades. In other cases, shift in the first gear for starting away from rest. Disengage the clutch when shifting in gears.**

Move the gearshift lever smoothly and without jerks. If a required gear is not shifted before starting the automobile away from rest, release the clutch pedal gently, and then disengage the clutch again and shift in a gear.

**Shift in the reverse gear only after a complete stop of the automobile.** When operating the automobile, do not keep the foot on the clutch pedal, as it would result in clutch partial disengaging and disk slipping. On slippery roads, drive the automobile evenly, with a low speed.

When braking engine, release completely the accelerator pedal.

Brake the automobile smoothly by depressing the braking pedal slowly. When braking unnecessarily, the tyres are worn quickly, and the fuel consumption is increased. When braking, do not allow slipping the wheels, as it decreases the efficiency of braking (in comparison with braking during rolling) and

increases wear of tyres. Besides, sharply and heavy braking could provoke skidding of the automobile.

When the automobile is to be operated on off-the-road (sand, mud, snow etc.), slippery roads, steep up-grades (more than 15 °C) and on other complicated sections of roads, do not overload the engine. In this case, engage the front axle, and on very complicated sections of roads, shift also the transfer box to a low range. Before engaging the front axle, engage the front wheels. Engage the front axle in motion, and shift the transfer box to low range only after a complete stop of the automobile.

**Overcoming Steep Up-Grades and Down-Grades.** When driving on roads with steep up-grades and down-grades, a driver should be very intent. Determine preliminarily an up-hill gradient and shift in a required gear which would ensure a required traction force of wheels. When overcoming steep up-grades, shift the transfer box to a low range and the gearbox in the first gear. Overcome up-grades without stopping and turnings, as far as possible. Overcome short up-grades provided with a convenient access and smooth riding surface by speeding up without engaging the transfer box to a low range and by shifting the gearbox in the second or third gears depending on an up-hill gradient. If for some reason, it is impossible to overcome an up-grade, take all precautions and descend slowly by shifting in the reverse gear. Descend little by little, do not speed up the automobile and do not disengage the clutch. When overcoming steep down-grades, take measures to ensure the safety of descending. When overcoming a long down-grade (more than 50 m), determine preliminarily its steepness, shift the gearbox in a required gear and engage the transfer box to a required range. Overcome such down-grades by engine braking.

**Overcoming Gutters, Roadside Cuvettes and Ditches.** Overcome gutters, roadside cuvettes and ditches at a low speed with the front axle engaged in the direction perpendicular to a down-grade with regard to dimensions of the automobile defining its cross-country capability. Do not overcome an obstacle with a rush, if a frontal impact against wheels could be occurred .

**Moving Along Muddy Country Roads and Graded Clay and Gumbo Roads.** When moving along clay and gumbo roads after pouring rain, the automobile could slip off the road. Be careful when choosing a direction of motion. Choose relatively level

grounds when moving along rut-roads if possible. It is very difficult to drive the automobile on very wet graded earth roads provided with steep grades and deep cuvetts. On these roads, drive carefully on the crest of the corrugation and at a low speed.

**Marsh-Ridden Sections of Roads.** Overcome marsh-ridden sections on straight line without sharp turns and stops. Engage the front axle and engage the transfer box to a low range, shift the gearbox in a gear which would provide a required traction force of the driving wheels. Turn smoothly with a great radius, do not decrease a speed. Do not drive on the track paved of an ahead moving automobile.

**Sandy Soils.** When overcoming sandy soils, drive smoothly without jerks and stops. Turn smoothly and with great radius. Shift in a possible high gear and engage the front axle, overcome sandy drifts and short sandy up-grades in a rush. Do not allow slipping the wheel, determine road conditions preliminarily and shift in a required gear which would provide a required traction force of wheels.

#### **Fording.**

Overcome a ford with a great care. The automobile could overcome a ford of a 500 m depth with a hard bottom at a low speed. Before overcoming a ford, check the bottom, make sure that there are no deep pits, big stones, swampy grounds, check the ground where the automobile would enter water and go out of water.

Cut the radiator shutter if it is available.

Overcome a ford slowly, do not make water surface choppy in front of the automobile, shift the gearbox in the first or second gears, engage the front axle and engage the transfer box to a low range.

Avoid manoeuvring and turning sharply.

After fording, as soon as possible but not later than on this day, check oil in all assemblies, change oil in an assembly where water is detected. If oil coulor is changed, it means that there is some water in oil. Lubricate all chassis grease nipples till fresh grease would be appeared. After fording, engage the clutch partly several times and brake partly several times for drying the clutch facings and brake shoe linings. If the engine is stopped when fording, try to crank up the engine by means of the starter two-three times.

If the engine is not started, the automobile is to be immediately evacuated out of water by all means. If some water is penetrated to the assemblies of the automobile, it is not recommended to run the automobile under its own power. Tow the automobile and carry out the required maintenance.

### **Snowy Surfaces**

The automobile could move along snowy surfaces of 350 mm depth. Turn the automobile in the same manner, as when moving on swampy grounds. When driving on quick snow, do the same, as when driving on sandy surface.

## **MAINTENANCE OF THE AUTOMOBILE**

Intervals and scope of automobile servicing are laid down in the Service Book.

The indications of this section allow both maintenance of the automobile and adjustment of its units to be well carried out. This section indicates also operations which should be carried out in intervals between servicing terms according to the Coupons.

### **DAILY MAINTENANCE**

1. Visually check the automobile for completeness of sets, check the body, glasses, rear view mirrors, licence plates, body coating, door locks, frame, springs, shock absorbers, wheels and tyres for proper condition. Eliminate detected faults.

Inspect the automobile to make sure there are no fuel, coolant, oil and brake fluid leaks. To this end, inspect the parking place.

Eliminate detected faults.

2. Fill up to normal coolant, oil, fuel and brake fluid.

3. Check functioning of lighting devices, signalling devices , windshield wiper. Eliminate defects.

4. Check functioning of the steering gear, brakes. Eliminate defects.

5. If the automobile is not kept in a garage, and is to be stored in cold weather, drain water from cooling system after each run.

6. Fill up the windshield washer reservoir. Use water for filling-up in summer.

7. If the automobile was operated on extremely dusty roads, as well as after fording and negotiation of natural road sections and off-road sections covered with mud, wash the filter element of the air cleaner or replace it.

## **SEASONAL MAINTENANCE**

The seasonal maintenance is carried out twice a year (in the spring and autumn) and, if possible, is combined with the next maintenance according to Coupons of Servicing Book.

### **Before the Summer Season of Operation**

1. Connect the air hose to the air cleaner union and set the manifold heat control valve in the "summer" position.
2. Drain the fuel tanks.
3. Remove the heater and windshield wiper motors, check the conditions of the commutator and brushes, wash and lubricate the bearings.
4. Switch on the windshield wiper for 15-20 min; the blades should be swung out of the way.

### **Before the Winter Season of Operation**

1. Disconnect the air hose from the air cleaner union and set the manifold heat control valve in the "winter" position.
2. Wash the fuel tanks and fuel filters.
3. Check coolant specific gravity in the engine cooling system, and if required, fill up to normal.
4. Flush the cooling system once in three years or after 60 000 km of run, drain coolant and refill the cooling system with fresh coolant.
5. Check the heating and body ventilation system for proper functioning.
6. Check the shutters for proper functioning.
7. Flush or replace the air cleaner of the vacuum brake booster.
8. Switch on the windshield wiper for 15-20 min; the blades should be swung out of the way.



## ENGINE

The automobile is equipped with the four-cylinder engine with upper valve arrangement which is shown in Fig. 20, 21.

Check and, if required, tighten the engine mounting (Fig.22). Tighten the engine mounting bolt nuts until distance sleeves touch the washers.

Tighten the cylinder head fastening nuts after completion of the automobile running-in period and every 1 000 km of run each time when removing the cylinder head.

Tighten the nuts only on a cold engine. Tighten the nuts in two steps in the sequence illustrated in Fig. 23: the first step -

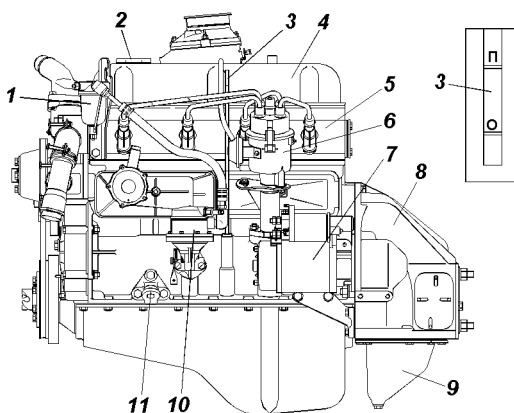


Fig. 20. Engine  
(l.h. view):

1 -fine fuel filter; 2 -oil filler cap ; 3 - oil dipstick; 4 -rocker arm cover; 5 -cylinder head; 6 -ignition-distributor; 7 -starter; 8 -clutch housing; 9 -clutch housing (lower part); 10 - fuel pump; 11 -engine mounting bracket

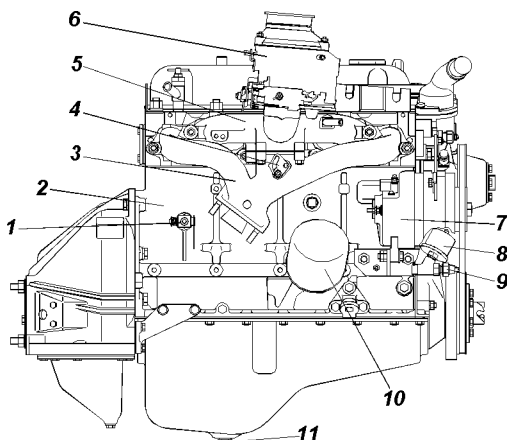


Fig. 21. Engine  
(r.h. view):

1 -cylinder block drain cock; 2 -cylinder block; 3 -inlet manifold; 4 -inlet manifold damper; 5 -inlet manifold; 6 -carburettor; 7 -alternator; 8 -oil pressure transmitter; 9 -low oil pressure warning lamp transmitter; 10 -oil filter; 11 -oil sump drain plug

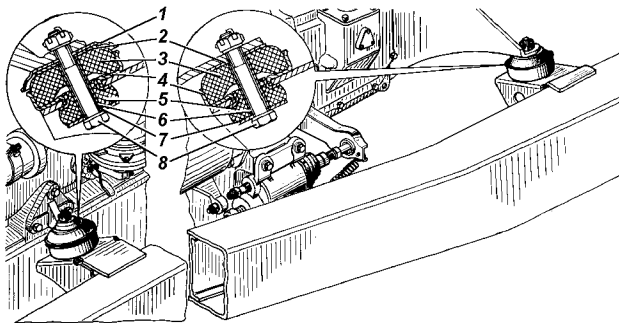


Fig. 22. Engine Mounting:

1 -protective cover; 2 -washer; 3 -upper pad; 4 -seat; 5 -lower pad; 6 -distance sleeve; 7 -washer; 8 -bolt

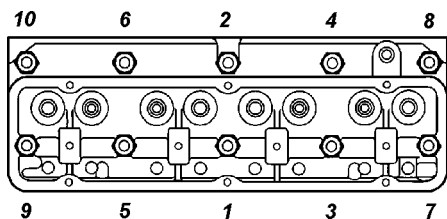


Fig. 23. Sequence of Tightening Cylinder Head Nuts

preliminarily with a less force, the second one - finally; the final tightening torque should be equal to  $90-94 \text{ N} \cdot \text{m}$  ( $9.0 - 9.4 \text{ kgf} \cdot \text{m}$ ).

As required, clean carbon deposit off the cylinder head, piston crowns and inlet valves.

**Valve gear.** Adjust the valve-to-rocker clearances on a cold engine using the following sequence:

- remove the vacuum governor hose;
- remove the rocker cover;

- using mark (Fig. 24) on the crankshaft pulley, set the piston of No.1 cylinder at the TDC on the compression stroke and check the clearance between the rockers and valves of No.1, 2, 4, 6 with the feeler gauge. In the case of an incorrect clearance, screw out lock nut (Fig. 25) of adjusting screw and rotating the letter with a screwdriver, set a required clearance by means of the feeler gauge. Then, holding the adjusting screw with the screwdriver, tighten the lock nut and check the clearance for correct setting;

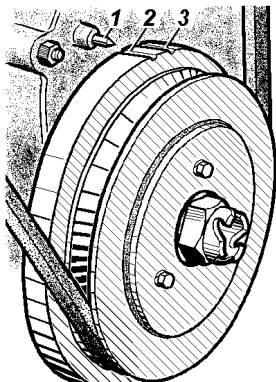


Fig. 24. Timing Marks on Crankshaft Pulley:

- 1 -index pointer; 2 -mark for setting TDC;
- 3 -mark for ignition timing

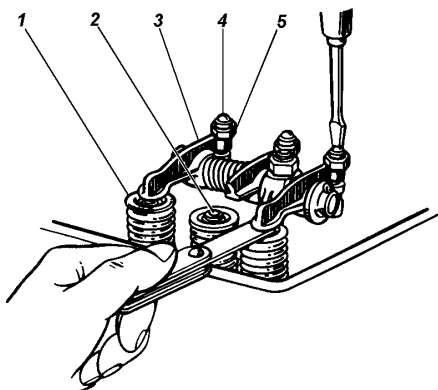


Fig. 25. Adjusting Clearance between Rocker Arm and Valve:

- 1 -valve spring retainer; 2 - valve; 3 -rocker; 4 -adjusting screw; 5 -lock nut

- having adjusted the clearances of one cylinder, turn the crankshaft through half a turn and adjust the clearances on other cylinders (3, 5, 7, 8).

The valve-to-rocker clearances on a cold engine (15-20 °C) for the exhaust valves of No.1 and No.4 cylinders (valves 1 and 8) should be equal to 0.30 - 0.35 mm, and for other valves - 0.35 - 0.40 mm.

### **Maintenance of the Lubrication System**

For cooling oil in the engine lubrication system, an oil cooler is provided. It is recommended to cut in the cooler by opening the cock 7 (Fig. 26) at an ambient temperature above +20 °C. But when riding on heavy roads (with heavy load and at a high engine crankshaft speed), also cut in the cooler depending on an ambient temperature.

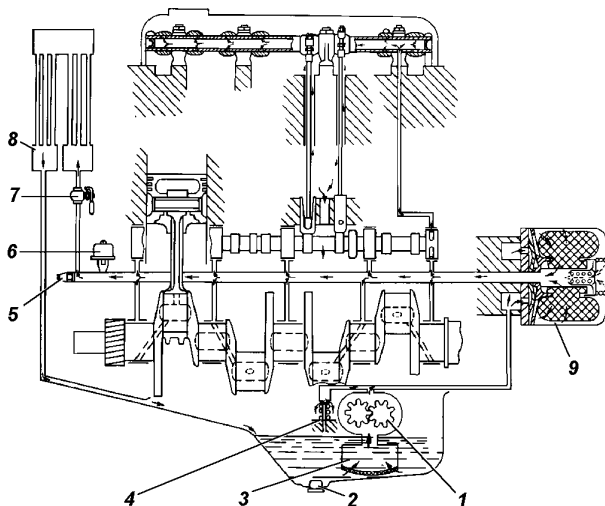


Fig. 26. Engine Lubrication Diagram:

1-oil pump; 2 -oil sump drain plug; 3 -oil intake strainer; 4-pressure relief valve;  
5 -low oil pressure warning lamp transmitter; 6 -oil pressure gauge transmitter;  
7 -oil cooler cock; 8 -oil cooler; 9 -full-flow oil filter

The level of oil in the engine crankcase should be in register with the mark "II" on oil dipstick 3 (Fig. 20). Measure the oil level 2-3 min after shutting down a warmed-up engine.

Drain oil from the engine crankcase right after the end of the trip when the oil is still hot. This insures rapid and complete drainage of oil.

For removing the oil filter 10 (Fig. 21), rotate it counter-clockwise. When installing a new filter, make sure, that the rubber sealing ring is in serviceable condition, lubricate it with motor oil, and screw in the filter by hand till the sealing ring would contact with the cylinder block surface, then draw up tight the filter through 3/4 of turn. Make sure, that there is no leakage of oil.

Oil pressure in the lubrication system of a warmed-up engine of a new automobile at a speed of 60 km/h in direct gear and when the oil cooler cock is open should be at least 343 kPa (3.5 kgf/cm<sup>2</sup>). Oil pressure in a cold engine can be increased to 588 kPa (6kgf/cm<sup>2</sup>), and on a hot summer day it could be dropped to 294 kPa (3kgf/cm<sup>2</sup>). Stop running the engine, when oil pressure is dropped to 118 kPa (1.2kgf/cm<sup>2</sup>).

When driving the automobile, watch the functioning of the oil pressure transmitters. The low oil pressure warning transmitter must operate at an oil pressure drop in the system down to 39-78 kPa (0.4-0.8 kgf/cm<sup>2</sup>).

The low oil pressure warning lamp may light when the hot engine is running at an idling speed, but the lamp must go out immediately with an increasing crankshaft speed.

**Immediately stop running the engine if some faults in the engine lubrication system are detected.**

### Maintenance of the Crankcase Ventilation System

For flushing and cleaning, remove the vacuum regulator from the engine and disassemble it. Clean the pipelines (Fig. 27), the calibrated orifice "b" (Fig. 28) and flush the parts of the vacuum regulator.

Check tightness between the case and cover plate when assembling the vacuum regulator.

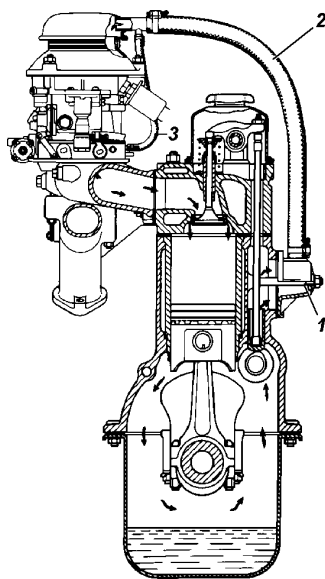


Fig. 27. Crankcase Ventilation:  
1 -oil baffle; 2,3 -pipes

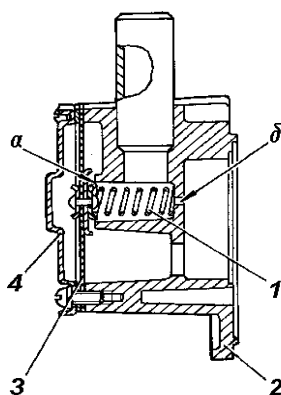


Fig. 28. Vacuum Regulator:  
a -valve seat; b-orifice  
1 -spring; 2 -body; 3 -diaphragm;  
4 -cover

## Maintenance of the Fuel System

**Fuel tanks.** To wash the fuel tanks, remove them from the automobile. Flush the fuel tanks with clean gasoline.

**Fuel filter-settler.** Periodically drain sediment and water through the drain hole stopped with a plug 8 (Fig. 29).

To remove the filter element for washing, unscrew the unions 2 and bolts 4. Do not disassemble the filter element. After washing, blow out the filter element with compressed air at a pressure not in excess of 98 kPa (1kgf/cm<sup>2</sup>).

**Fuel pump.** Periodically check the fuel pump through the inspection hole "a" (Fig. 30) for leakage of fuel. Leakage of fuel indicates, that the diaphragm is faulty.

Periodically check the attachment of the pump to the engine and the connections of the pipelines for tightness. Flush the gauze strainer and remove dirt from the upper casing.

**Fine fuel filter 1** (refer to Fig. 20) Periodically disassemble the fine fuel filter for flushing the bowl and filter element.

**Carburettor.** The carburettor K-151B is installed on the engine 4178, and the carburettor K151E is installed on the engine 4218. The carburetors are identical in design, except for some jets. The main jets are indicated in the Appendix 3.

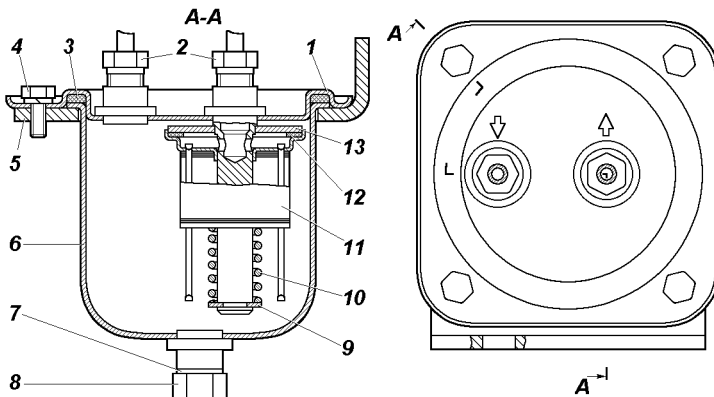


Fig. 29. Fuel Filter-Settler:

1 -cover; 2 -pipe unions; 3, 7, 12 -gasket; 4 -bolt; 5 -bracket; 6 -settler body; 8 -drain plug; 9, 13 -washer; 10 -spring; 11 -filter element

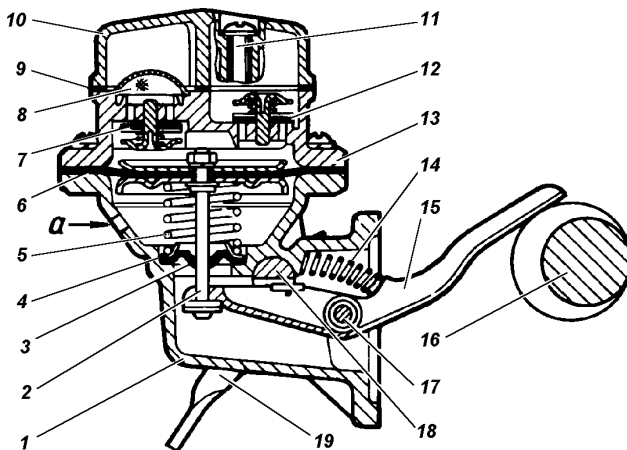


Fig. 30. Fuel Pumps of B9B type\*:

a - inspection hole

1 - casing; 2 - pull rod; 3 - seal; 4 - washer; 5, 14 - springs; 6 - diaphragm; 7 - discharge valve; 8 - gauze strainer; 9 - gasket; 10 - cover; 11 - screw; 12 - exhaust valve; 13 - upper casing; 15 - rocker arm; 16 - camshaft eccentric; 17 - rocker arm shaft; 18 - hand primer lever shaft; 19 - hand primer lever

\* The pumps 2105-1106010-50 or 900-1106010 could be also installed

**Maintenance of the carburettor** includes periodic checks and adjustment of fuel level in the float chamber, adjustment of the crankshaft slow idling setting, check of the acceleration pump and economizer for functioning, cleaning, blowing and washing of the carburettor parts to remove gum residue, capacity checks of jets.

Check fuel level in the carburettor with the automobile placed on a level ground and the engine stopped.

The fuel level in the carburettor float chamber should be within 20-23 mm from joint plane of the float chamber. Adjust the fuel level by bending lip 3 (Fig. 31). The float should be in the horizontal position. The valve 5 stroke is adjusted by means of the lip 2 and should be 1.5 - 2.0 mm.

Slow idling speed of the crankshaft at  $700-750 \text{ min}^{-1}$  is to be adjusted by means of the screw 1 (Fig. 32) when the engine is warmed up. The screw 2 is used for adjusting the CO content.

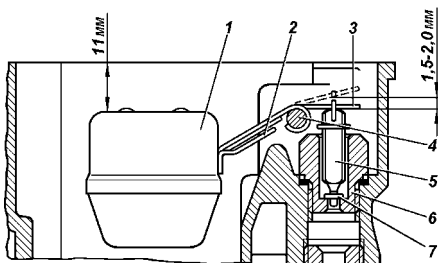


Fig. 31. Carburettor Float and Its Adjustment:

1 -float; 2 -fuel valve adjustment lip; 3 -level adjustment lip; 4 -pin; 5 -valve needle; 6 -valve body; 7 -valve washer

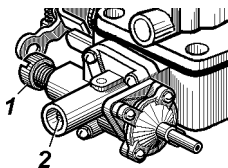


Fig. 32. Carburettor (fragment):

1 -idle speed adjustment screw; 2 -idle mixture adjustment screw

After adjustment done, place on the adjustment screw a new cap, that the content of mixture could be only leaning (by screwing in the cap). It recommended to adjust the screw 2 only by special tools for analysing of exhaust gases.

**Air cleaner.** When the automobile is to be operated under very dusty conditions, carry out the maintenance of the air cleaner in the intervals between servicing according to Coupons.

Do not clean the filter element more than 15 times. For cleaning, use the following ways: wash the filter element with water adding syntetic washing agent and then rinse it, wring gently out and dry; blow it out or clean by shaking off.

For replacing or cleaning the filter element, proceed as follows: loosen bolts 8 (Fig.33) and yoke 2; shift clamps 9; take away cover 6 with filter element 5; take away yoke 10 and filter element from frame. Assembly the air cleaner in the reverse sequence.

Never use the air cleaner with defective muff 1.

Replace the filter element when bursting or burning the filter element, every 100 000 km of run, after maximum permissible procedures of cleaning.

Flush the gauze 4 of the flame trap with one of the dissolvents: kerosene, turpentine, white spirit.

**Inlet manifold.** During seasonal maintenance, set the manifold heat-control valve (Fig. 34) to the position corresponding to the coming season of the year.



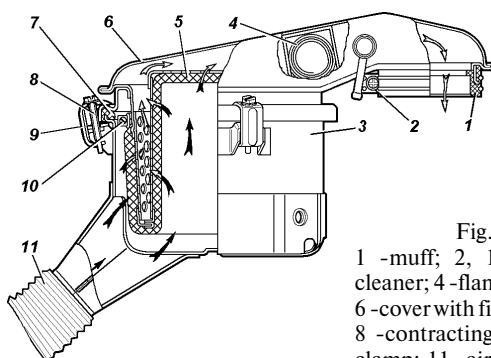


Fig. 33. Air Cleaner:  
1 -muff; 2, 10 -yokes; 3 -body of air cleaner; 4 -flame damper; 5 -filter element; 6 -cover with filter element frame; 7 -sealer; 8 -contracting bolt; 9 -cover attachment clamp; 11 -air intake hose

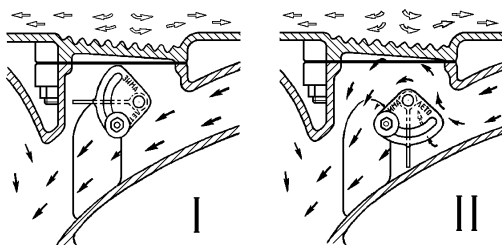


Fig. 34. Manifold Heat Control Valve:  
I -heat control valve OFF (summer);  
II -heat control valve ON (winter)

**Accelerator pedal.** While in service, it may become necessary to adjust the carburettor throttle full opening and readjust the accelerator pedal position. If the pedal is pressed all the way down and the throttle is not fully open, shorten the pedal rod rotating adjusting sleeve 3 (Fig. 35). Shorten it to such a length that full opening of the carburettor throttle is ensured but compensating spring at the same time is not completely compressed.

When released, the accelerator pedal should be at a distance of 80-95 mm from the toeboard. If the threaded portion length of the accelerator pedal rod is not sufficient for the adjustment, change the length of rod screwing it out of the rod end.

As required, lubricate the carburettor manual control linkage with lubricating grease. Before lubrication, remove it from the automobile and take off old grease.

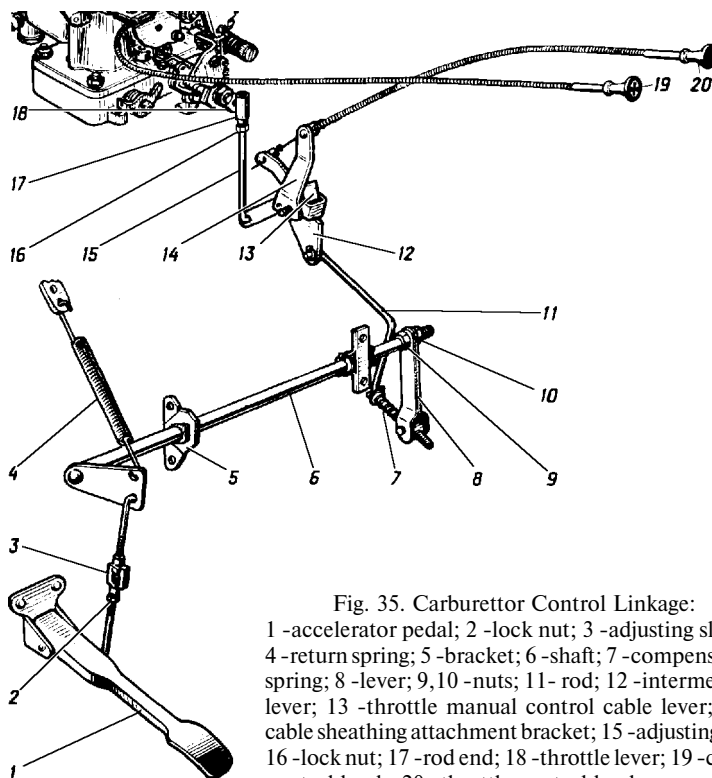


Fig. 35. Carburettor Control Linkage:

1 -accelerator pedal; 2 -lock nut; 3 -adjusting sleeve; 4 -return spring; 5 -bracket; 6 -shaft; 7 -compensating spring; 8 -lever; 9,10 -nuts; 11 -rod; 12 -intermediate lever; 13 -throttle manual control cable lever; 14 -cable sheathing attachment bracket; 15 -adjusting rod; 16 -lock nut; 17 -rod end; 18 -throttle lever; 19 -choke control knob; 20 -throttle control knob

### Maintenance of the Engine Cooling System

The engine cooling system (Fig. 36) is filled with coolant simultaneously with the heating system.

Low-freezing fluid ОЖ-40 "Лена" or ТОСОЛ-А40М is used as a coolant.

At ambient air temperatures below  $-40^{\circ}\text{C}$ , fill the system with low-freezing fluid ОЖ-65 "Лена" or ТОСОЛ-А65М.

If the above-mentioned grades of coolant are not available, You may use other coolant recommended by the automobile dealer.

Bear in the mind that antifreeze is poisonous.

The coolant level should be 30-40 mm above the MIN level mark inscribed on the expansion tank.

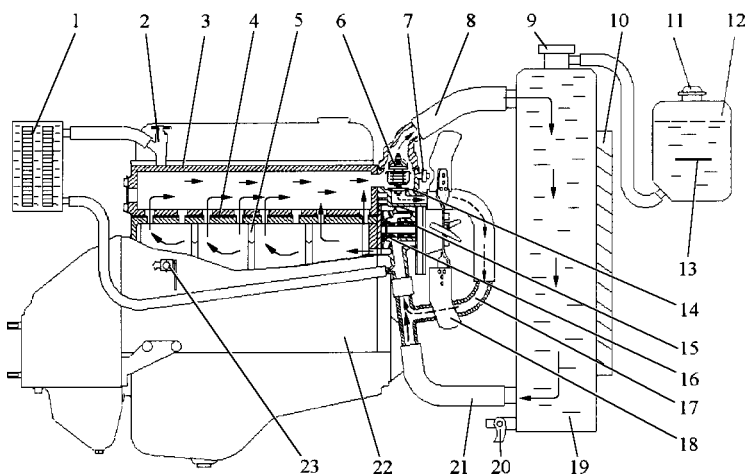


Fig. 36. Cooling System Diagram:

1 -heater radiator; 2 -heater cock; 3 -cylinder block head; 4 - gasket; 5 -coolant channels between cylinders; 6 -two-valves thermostat; 7 -coolant temperature gauge transmitter; 8 -outlet pipe; 9 -filler neck; 10 -shutters; 11 -filler cap; 12 - expansion tank; 13 - MINIMUM level mark; 14 -thermostat body; 15 - pump; 16 -impeller; 17 -connection; 18 -fan; 19 -radiator; 20 -radiator drain cock; 21 -intake pipe; 22 -cylinder block; 23 -cylinder block drain cock

Never mix the coolants of different grades. If the level of special fluid in the system has dropped and fluid of the same grade is not available, top up the system with clean soft rainy, snow or boiled water.

Bear in mind that the freezing point of the antifreeze diluted with water is higher. Fill the system with antifreeze of appropriate grade at the first opportunity.

If the special coolant is not available, it is permissible to use clean soft water. In this case, at the ambient temperature below 0 °C proceed as follows:

- disconnect the hose from the expansion tank and lower it to carry off steam from the radiator;
- when parking, drain coolant from the engine cooling system and heating system.

Keeping the coolant temperature in a range of 80 to 90 °C during operation of the automobile considerably decreases wear of the engine and cuts down fuel consumption. The recommended temperature is maintained by means of an automati-

cally operated thermostat and the shutters controlled by the driver.

In cold weather, we recommend to encase the cooling system for warmth-keeping.

The coolant temperature gauge located on the instrument panel controls the temperature of coolant.

Besides this, the lamp with red light filter warns of coolant overheating. The lamp goes on at the coolant temperature between 91 and 98°C for automobiles operating in regions with temperate climate, and at the coolant temperature between 102 and 109 °C for automobiles operating in regions with tropical climate. When lighting the coolant temperature overheating warning lamp, immediately determine and eliminate the cause of overheating.

The rise of the coolant temperature may be caused by the drop of coolant level in the radiator, loose tension of the fan belt, faulty fan drive coupling, by movement of the automobile with the closed shutters and with the closed valve of warmth-keeping boot.

Adjust deflection of the fan belt (Fig. 37) by turning the alternator. Normal deflection of the belt equals 8-14 mm with an effort of 4 kgf (37 N) applied to it.

When using water as a coolant, periodically remove from the cooling system scale and dirt by flushing them with a fast jet of clean water. Flush the engine separately from the radiator so that rust, scale and sediment from the engine cooling jacket do not clog the radiator (Fig. 38). Prior to flushing the engine, remove the thermostat.

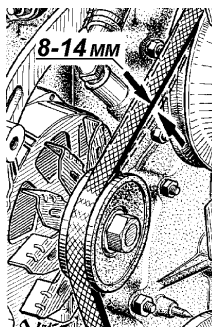


Fig. 37. Checking Fan Belt Tension

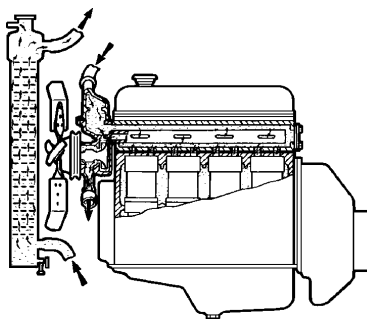


Fig. 38. Flushing Cooling System

**Drain coolant from the cooling system** through two cocks. One of them is arranged on the radiator lower reservoir, the other on the cylinder block. When draining the coolant, remove the radiator cap and open the cock.

**Notes.**

1. On some automobiles, the engines 4178 are installed, with feeding coolant to cylinder head completed with the pump of the cooling system in which design the ball bearings are applied.

2. On some automobiles, the visco coupling of the fan drive is installed, its purpose is to reduce fuel consumption, fan noise. It also reduces the time required for cold engine warm up and maintains the engine efficient operating condition. Keep the outer surface of the coupling clean.

### **Maintenance of the Ignition System (Fig. 39)**

If the transistor switch or the coil of the magnetic pulse distributor stator failed en route, change over to operation with the emergency vibrator for which purpose, disconnect the wire from the terminal K3 of the transistor switch and connect it to the terminal of the emergency vibrator.

Service life of the emergency vibrator is limited to 30 h, therefore switch it into operation only in emergency cases and replace a faulty unit at the first opportunity.

Simultaneously, when switching into emergency operation, switch off the system of idling-speed economizer for which purpose, connect by means of one of the hoses unions 1 and 2 (Fig. 40) of the carburettor between themselves missing the electromagnetic valve. Otherwise, the engine could be stopped when the throttle pedal is released fully.

After restoring the contactless ignition system (replacing of the magnetic pulse distributor or transistor switch), restore the previous connections of the carburettor.

Maintenance of the system consists in setting the ignition timing, regularly cleaning the rotor and cover of the magnetic pulse distributor, high-voltage part of the ignition coil and spark plugs, in timely lubricating the magnetic pulse distributor. and checking spark gap.

Check spark plug gap with a feeler gauge (Fig. 41). The gap should be equal to  $0.8^{+0.15}$  mm. Adjust the gap by bending the side electrode.

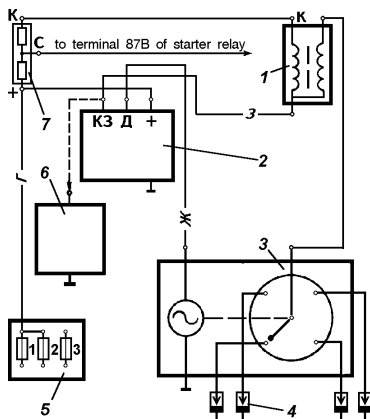


Fig. 39. Diagram of Transistor Ignition System:

- 1 -ignition coil; 2 -transistor switch;
- 3 -pickup-distributor; 4 -spark plug;
- 5 -fuse unit; 6 -emergency vibrator;
- 7 -series resistor

Wire Color Code:

Г -blue; К -red; Ж -yellow; 3 -green

Fig. 40. Carburettor Mixing Chambers Housing:

- 1 -economizer union;
- 2 -sole-noid valve vacuum supply union;
- 3 -union for vacuum supply to vacuum spark advance control

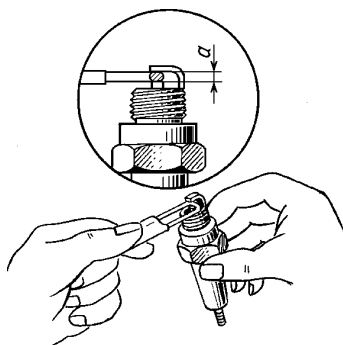
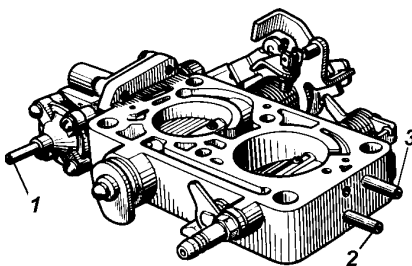


Fig. 41. Checking Spark Gap  
a -gap

**For setting the ignition timing, proceed as follows:**

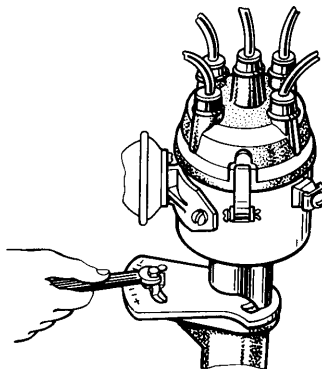
1. Set the piston of No. 1 cylinder at the TDC on the compression stroke until the timing hole on the crankshaft pulley gets in register with the timing pointer on the timing gear cover.

2. Remove the cap from the magnetic pickup.
3. Make sure that the contact segment of the runner is set against the cap terminal marked with numeral "1".
4. Loosen the bolt with the indicator, clamp the octane selector plate to the drive body so that the indicator is in register with the middle division mark of the octane selector scales, and tighten the bolt.
5. Loosen the bolt securing the octane selector plate to the magnetic pickup and distributor unit body (Fig. 42).
6. Holding the runner and forcing it clockwise (to take up the backlash in the drive), carefully turn the distributor body until the red mark on the rotor is aligned with the index pointer on the stator. Using the bolt, secure the octane selector plate to the distributor body.
7. Reinstall the cap of the magnetic pickup and distributor unit and check to see that the ignition wires running to the spark plugs are set correctly in compliance with the engine firing order (1-2-4-3), counting counterclockwise.

Each time after setting the timing, check for correct spark timing by listening to the running engine, with the automobile in motion. To this end, warm the engine up to a temperature of 80 °C and while moving in the direct gear on a level road at a speed of 40 km/h, accelerate the automobile by sharply depressing the accelerator pedal. If a light and short-time detonation is heard before a speed of 55-60 km/h is reached, it means that the ignition timing is set correctly.

In case of a heavy detonation, turn the magnetic pickup and distributor unit body counterclockwise through 0.5-1.0 division

Fig. 42. Adjusting Octane Selector Setting



on the octane selector scale. Each division of the scale corresponds to a change of the ignition timing by 4° in the degrees of the crankshaft angle. If the detonation was not heard at all, increase the ignition advance angle by turning the body of the magnetic pickup and distributor unit clockwise.

**Note.** To prevent the surface sparkover and burning through of the magnetic pickup and distributor unit cap, see that the shoes of the high-tension wires are completely seated in the cap terminal sockets. Never switch on the ignition if moisture is detected on the cap. Keep the plastic parts (cap, runner, low-tension terminal, sockets, etc.) clean.

**Forbidden** to keep the ignition on when the engine is not operating, and to disconnect the storage battery when the engine is operating.

## TRANSMISSION

### Maintenance of the Clutch

The automobile is equipped with a dry single-plate clutch (Fig. 43) provided with the pressure plate 4 with the cover plate 20, pressure springs 19 and release levers 11 in assy, driven disk 3 with linings and torsional vibration damper in assy.

Some automobiles are equipped with a dry single-plate clutch provided with the central pressure spring of the diaphragm type. The clutch consists of the pressure plate with the cover plate and of the pressure disk diaphragm spring which tabs function as release levers; driven plate with linings and torsional vibration dampers.

A grease cup for the clutch release bearing identifies visually the clutch type. The clutch with the pressure springs and release levers is provided with the grease cup to be found on the right-hand side of the engine (in motion). The clutch with the central diaphragm pressure spring is not provided with a grease cup.

Maintenance of the clutch consists in cleaning of dirt, tightening the bolt joints, adjusting and lubricating the clutch release bearing.

The clutch release bearing with the central diaphragm spring needs no grease.

Periodically drain condensate from the clutch housing unscrewing the plug 22 (Fig. 43).

Maintenance of the clutch control linkage amounts to



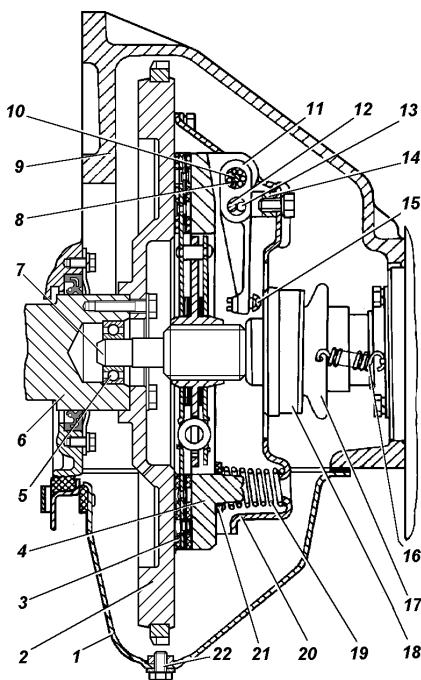


Fig. 43. Clutch:

1 -clutch housing lower part;  
 2 -flywheel; 3 -driven disk; 4 -  
 pressure plate; 5 - front bearing;  
 6 -crankshaft; 7 -input shaft; 8 -  
 needle bearing; 9 -clutch hous-  
 ing; 10 -release lever pin; 11 -  
 release lever; 12 -release pin;  
 13 -release roller; 14 -release  
 lever fork; 15 -adjusting screw;  
 16 -retracting spring; 17 -clutch  
 release sleeve; 18 -clutch release  
 bearing; 19 -pressure spring; 20 -  
 clutch housing; 21 -heat insulat-  
 ing washer; 22 -plug

adjustment of the pedal free travel, to periodical checks on the level of fluid in the reservoir of the clutch hydraulic system master cylinder and to bleeding the hydraulic system if required\*.

The level of fluid should be 15-20 mm below the upper edge of the reservoir.

Perform adjustment of the clutch release pedal by changing the length of the master cylinder pushrod 5 (Fig. 44).

Perform adjustment of the pedal free travel (35-55 mm) by changing the length of the slave cylinder 25 pushrod 31.

The clutch with the central diaphragm spring needs no adjustment of free travel. The free travel (5-30 mm) is maintained by the clutch design.

\* All the operations of bleeding the clutch hydraulic system are similar to operations of bleeding the hydraulic brake system (refer to section "Maintenance of the Service Brakes")

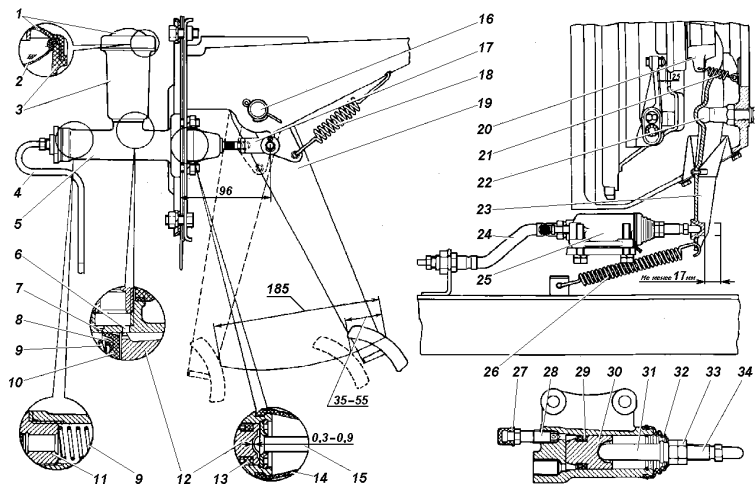


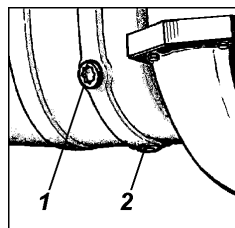
Fig. 44. Clutch Control Linkage with Pressure Springs and Release Levers:  
 1 -cover; 2 -filter gauze; 3 -reservoir; 4 -hydraulic pipe; 5 -master cylinder; 6 -bypass hole; 7 -compensating hole; 8 -washer; 9,18,21,26 -springs; 10 -cup; 11 -union; 12 -master cylinder piston; 13 -collar; 14 -boot; 15 -master cylinder pushrod; 16 -pedal shaft; 17 -fork; 19 -pedal; 20 -muff; 22 -ball support; 23 -clutch release fork; 24 -hydraulic hose; 25 -operating cylinder; 27 -cap; 28 -bleeder valve; 29 -collar; 30 -slave cylinder piston; 31 -pushrod; 32 -boot; 33 -lock nut; 34 -pushrod screw-in part;

### Maintenance of the Gearbox

Maintenance of the transmission consists in checking the oil level (Fig. 45), in changing the oil at established intervals specified in Lubrication Table and in periodically checking the joints for proper fastening.

In case of oil leakage, find out its cause and replace faulty parts (gaskets, collars).

Fig. 45. Gearbox Plugs:  
 1 -filler hole plug;  
 2 -drain hole plug



## Maintenance of the Transfer Box

Maintenance of the transfer box in service comes to checking the oil level and changing oil at intervals specified in Lubrication Table, and also to checking periodically all attachment parts.

When changing or refilling oil in the transfer box, check simultaneously the level of oil in the gearbox. The level of oil should reach the lower edge of the check holes 1 (Fig. 45, 46).

During operation of the automobile, the level of oil in the gearbox could be lowered to 8 mm relatively the lower edge of the check hole 1 (Fig. 45), and simultaneously it could be raised in the transfer box. Levelling of the oil levels is not obligatory.

Lubricate the shaft of the control levers through the grease fitting. The access to it is from below.

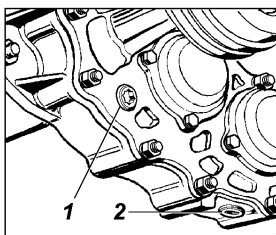


Fig. 46. Transfer Box Plugs:

1 -filler hole plug; 2 -drain hole plug

## Maintenance of the Propeller Shafts

Periodically check tightening of the bolts attaching the propeller shaft flanges, periodically lubricate them, clean the propeller shafts of dirt.

Lubricate the splined joint through the grease fitting 1 (Fig. 47) screwed in the slip yoke, and the needle bearings are lubricated through the grease fittings 2 on the centre cross.

Lubricate the needle bearings until grease is shows up from under the working edges of the centre cross seals.

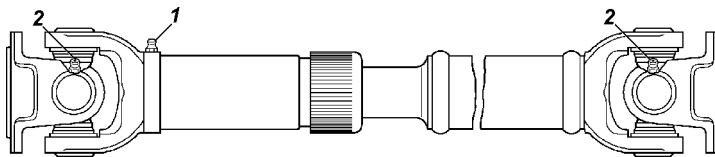


Fig. 47. Rear Propeller Shaft:

1 -grease fitting for lubricating of splined joints; 2 -grease fitting for lubricating of joint needle bearings

Apply grease according to the directions of Lubrication Table.

Do not apply too much grease to the splined joint as it would bleed through the splined joint and that would provoke the preliminary failure of the seals and could force the plug of the slip yoke.

Use a special tip to be fitted on the grease gun to lubricate the propeller shaft. The tip is available in the driver's tool kit.

### **Maintenance of the Rear Axle**

Maintenance of the rear axle comes to maintaining the level of oil in the housing and its timely changing, checking the condition of the seals. Periodically clean the safety valve 1 (Fig. 48), tighten up all fastening parts.

Apply grease according to the directions of Lubrication Table.

Check the oil level which should reach the edge of the filler hole.

Drain oil through the hole at the bottom of the housing by screwing out the filler plug.

Check also the level and change oil in the hub drive housings when the axles are provided with the hub drives.

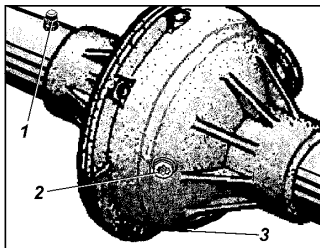


Fig. 48. Rear Axle:  
1 -safety valve; 2 -filler hole plug;  
3 -drain hole plug

### **Maintenance of the Front Axle**

All the directions on maintenance of the rear axle are valid for the front axle.

Maintenance of the steering knuckles should be carried out additionally.

Lubricate the steering knuckle kingpins through the grease fitting 10, 5 (Fig. 49, 50) according to directions of Lubrication Table.

When inspecting the steering knuckles of the front axle, check to be sure that the adjusting bolts 27, the steering stop 28 are in serviceable condition and are reliably locked with the nut.

The front driving axle is provided with a device for disengagement of the front wheels (Fig. 49 III, 50 III).

For disengaging the front wheels, remove hub cap 18, 16 (Fig. 49, 50) and by screwing out bolt 16, 17 set coupling in position in which a circular indicating groove "a" on the surface of coupling is arranged in one plane with the face of flange 14, 13 (Fig. 49, 50, view III). Having set coupling in a required position, screw on hub cap.

For engaging the wheels, screw in bolt 16, 17 as far as it will go. Be sure to engage and disengage both front wheels.

Some automobiles could be equipped with a sleeve for disengagement of the front wheels, shown in Fig. 49 IV, 50 IV. For disengaging the wheels, turn the disk of the sleeve counter-clockwise as far as it will go arranging in one plane the mark "6" with the figures "4x2". For engaging the wheels, turn the disk of the sleeve clockwise as far as it will go arranging in one plane the mark with the figures "4x4".

**Never engage the front axle when the front wheels are disengaged.**

## CHASSIS

### Towing Hook

The towing hook is intended for towing a trailer or an automobile by means of flexible coupling, and also it allows a short-time operation by means of rigid coupling. Towing of a trailer on a broken ground is not allowed.

The hook is provided with a catch 3 (Fig. 51) which closes the mouth of hook and is locked in the closed position by means of the pawl under the action of the spring.

The pawl in the catch is closed by a cotter 4 to avoid spontaneous uncoupling.

Maintenance of the towing hook comes to periodically cleaning of dirt, checking it for reliable attachment to the rear cross-member and lubricating according to the directions of Lubrication Table.

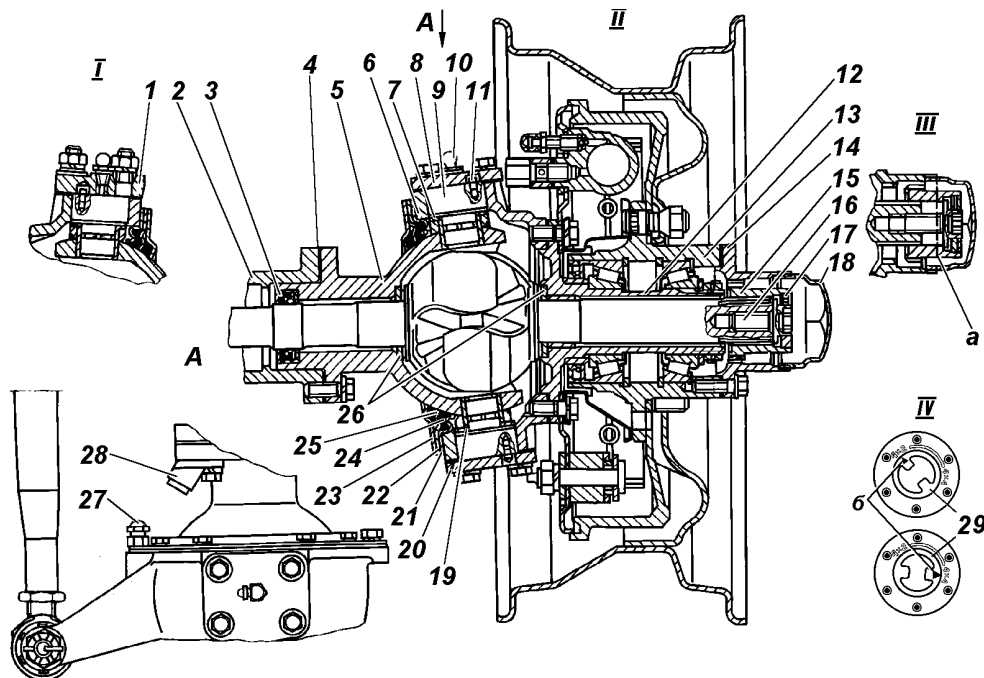


Fig. 49. Steering Knuckle:  
 a -indicating groove; 6 -indica-  
 tor;  
 I -right-hand steering knuckle;  
 II -left-hand steering knuckle;  
 III -wheels disengaging sleeve;  
 IV -wheels disengaging sleeve;  
 1 -steering knuckle arm; 2 -axle  
 shaft housing; 3 -seal; 4, 20 -  
 gaskets; 5 -ball support; 6 -  
 steering knuckle housing; 7 -  
 thrust washer; 8 -cover plate;  
 9 -kingpin; 10 -grease fitting;  
 11 -lock pin; 12 -journal; 13 -  
 wheel hub; 14 -driving flange;  
 15 -coupling; 16 -coupling bolt;  
 17 -lock bolt; 18 -protective  
 cover; 19 -kingpin bushing;  
 21 -inner casing; 22 -ring-baf-  
 fler; 23 -outer casing; 24 -  
 rubber sealing ring; 25 -felt seal-  
 ing ring; 26 -thrust washers;  
 27 -steering stop bolt; 28 -  
 steering stop; 29 -coupling disk

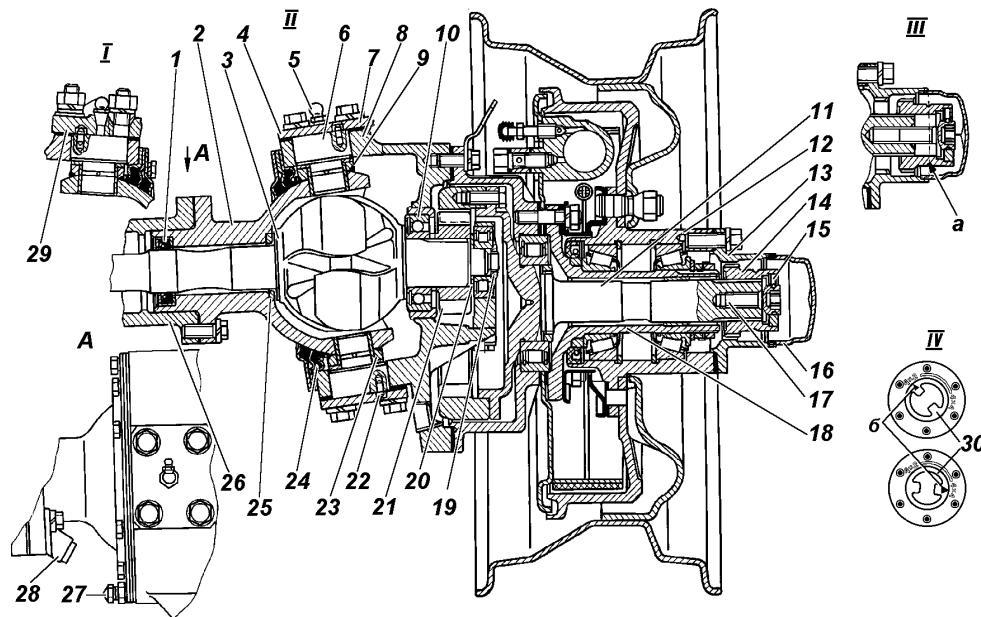


Fig. 50. Axle Steering Knuckle  
with Hub Drive:

a -indicating groove;

6 -indicator;

I -right-hand steering knuckle;

II -left-hand steering knuckle;

III -wheels disengaging sleeve;

IV -wheels disengaging sleeve;

1 -seal; 2 -ball support;

3 -steering knuckle joint; 4 -gasket; 5 -grease fitting; 6 -kingpin; 7 -cover plate; 8 -steering knuckle housing; 9 -kingpin bushing; 10 -bearing; 11 -driven shaft of hub drive; 12 -hub; 13 -driving flange; 14 -coupling; 15 -locker ball; 16 -protective cap; 17 -coupling bolt; 18 -journal; 19 -locking nut; 20,23 -thrust washers; 21 -hub drive pinion; 22 -lock pin; 24 -rubber sealing ring; 25 -thrust washer; 26 -axle shaft housing; 27 -steering locking angle adjusting bolt; 28 - steering stop; 29 -steering knuckle arm; 30 -coupling disk

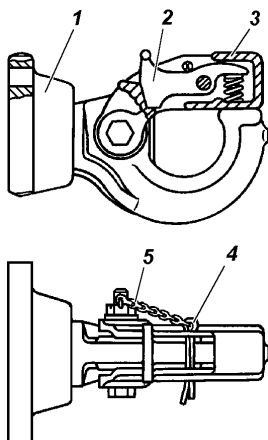


Fig. 51. Towing Gear of Rigid Type:  
1 -case; 2 -pawl; 3 -catch; 4 -cotter pin;  
5 -chain

## Suspension

The suspension of automobiles YA3-31512, YA3-311514, YA3-31519 (Fig. 52) consists of four longitudinal semielliptic springs functioning in conjunction with four hydraulic telescopic shock absorbers. The front and rear shock absorbers are identical in design and interchangeable.

The automobile YA3-3153 and some automobiles YA3-31512, YA3-31514, YA3-31519 are equipped with a combined suspension: the front suspension (Fig. 53) - spring with transverse stabilizer, the rear one (Fig. 54) - on small-leaf springs. The front and rear shock absorbers of the combined suspension are not interchangeable.

### Maintenance of the Suspension

Periodically check the condition and attachment of the springs and shock absorbers. To prevent corrosion and eliminate squealing noise, lubricate the spring leaves at least once a year. To lubricate the springs, remove them from the automobile, disassemble, wash in kerosene, dry and lubricate each leaf with a grease according to Lubrication Table. The small-leaf springs of combined suspension need no grease.

Knocks and squeaks in the spring eyes are symptoms of worn-out rubber pads.

When installing the springs, carry out the last tightening of the U-bolt nut on the automobile standing on the wheels.



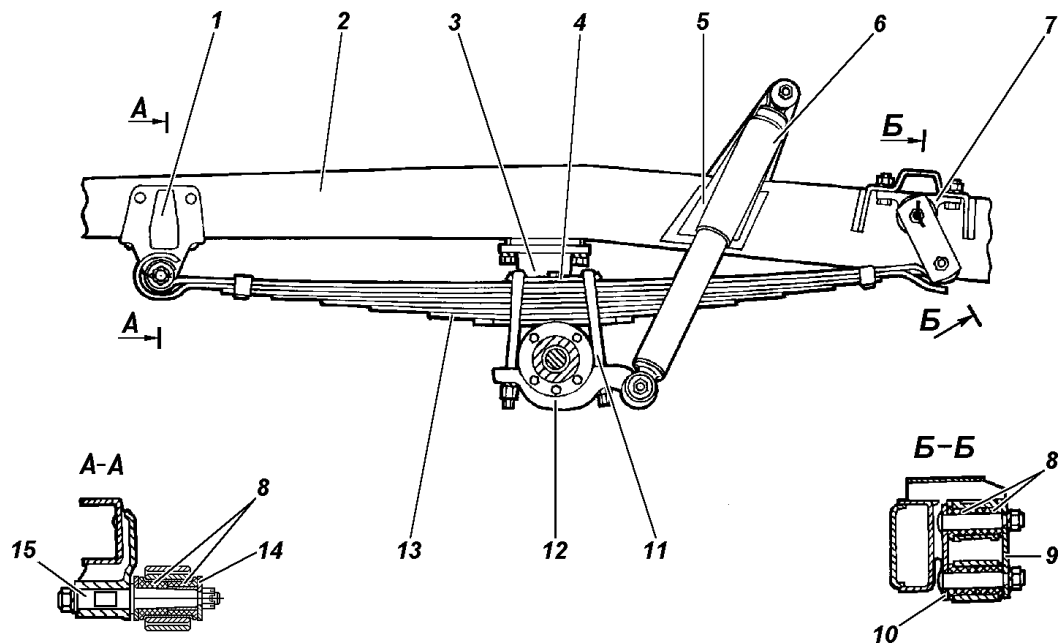


Fig. 52. Front Suspension of Automobiles YA3-3152, YA3-31514, YA3-31519:

- 1 - front hanger; 2 - frame; 3 - buffer; 4 - cover plate; 5 - shock absorber hanger; 6 - shock absorber; 7 - rear hanger; 8 - rubber bushings; 9 - shackle outer cheek; 10 - shackle inner cheek; 11 - U-bolt; 12 - gasket; 13 - spring; 14 - washer; 15 - spring axle

1-longitudinal lever; 2-tie-rod; 3,9-rubber-metal joints; 5-longitudinal lever hinges; 6-rubber joints; 7,8-nuts; 10,11-tie-rod hinges; 12-spring; 13,14-spring hinges; 15-vibration damping gasket; 16-stabilizer; 17-stabilizer bracket; 18,19-rubber bushings; 20-U-bolt; 21-buffer; 22-shock absorber

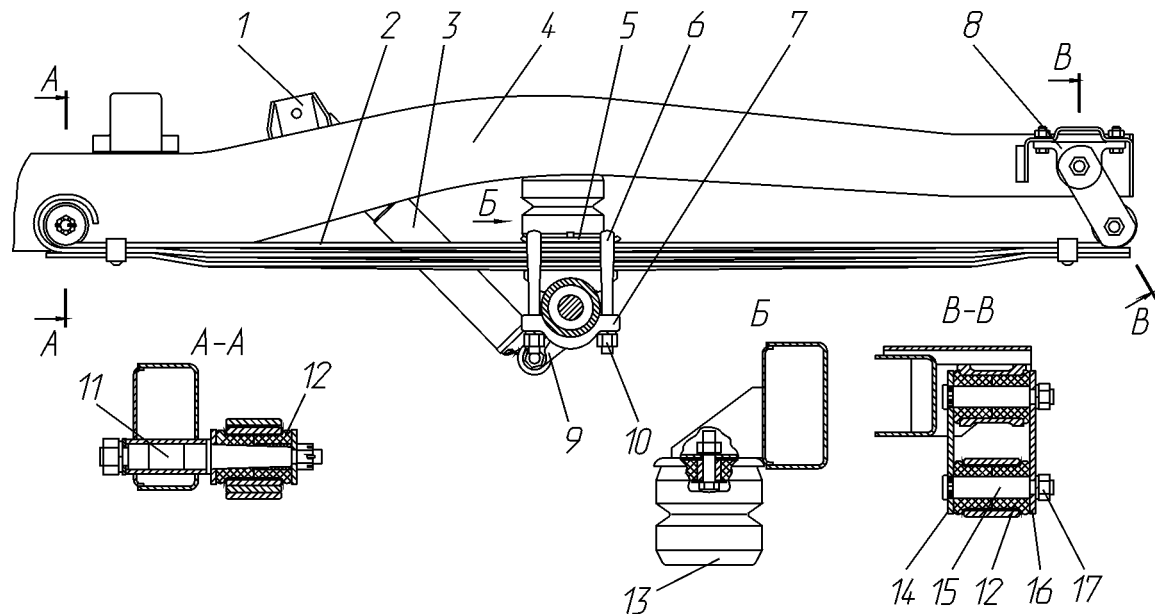


Fig. 54. Rear Suspension on Small-Leaf Springs:

1-shock absorber hanger; 2-spring; 3-shock absorber; 4-frame; 5-cover plate; 6-U-bolt; 7-pad; 8-shackle bracket; 9-shock absorber hanger; 10-U-bolt nut; 11-axle; 12-rubber bushing; 13-buffer; 14-shackle inner cheek; 15-pin; 16-shackle outer cheek; 17-pin nut

Maintenance of the front spring suspension comes to checking and tightening the joints of longitudinal lever, tie-rod and transverse stabilizer. Knocks and squeaks in the joints are the symptoms of worn-out joints. Remedy these troubles by replacing these joints. In the service period, do not allow a deformation of the tie-rod and steering linkage. When replacing the joints, carry out the last tightening of nuts on the automobile standing on the wheels.

**Never operate the automobile provided with the spring suspension when the shock absorber is faulty or when there is no shock absorber on the automobile.**

Maintenance of the shock absorbers consists in periodically checking them for tightness and reliable fastening, as well as in changing the fluid in compliance with the instructions laid down in Lubrication Table.

If leakage of fluid through the rod seal and the reservoir sealing rings is detected, tighten nut 18 (Fig. 55). If the leakage fails to be eliminated, repair the shock absorber in a workshop.

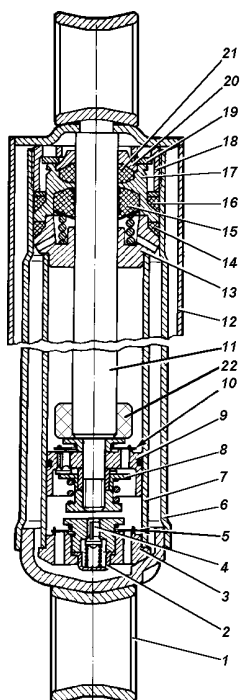


Fig. 55. Shock Absorber:

1 -eye; 2 -compression valve stop 3 - compression valve body; 4 -compression valve; 5 -inlet valve; 6 -reservoir; 7 -cylinder; 8 -rebound valve; 9 -piston; 10 -by-pass valve; 11 -rod; 12 -housing; 13 -rod guide bushing; 14 -lower sealing ring ; 15 -seal; 16 -upper sealing ring; 17 -seal holder; 18 -reservoir nut; 19 -washer; 20 -protective ring; 21 -rod seal; 22 -rebound buffer (rebound buffer is installed only in shock absorbers of front spring suspension)

## Wheels, Tyres

Attachment of the spare wheel is shown in Fig. 56. When opening the tail gate, swing the hinged wheel carrier together with the spare wheel to the right through 90 °C .

When maintaining, inspect the wheels and tyres for proper condition, check the wheel attachment nuts for tightening and the tyre inflation pressure.

To provide for uniform tightening of the nuts, tighten them alternately, every second one.

Before every run, check the condition of tyres and eliminate detected defects. Periodically check the tyre inflation pressure and bring it to normal, if required.

Check inflation pressure in cold tyres.

If an uneven wear of the front wheel tyres is detected, check and adjust the toe-in of the front wheels.

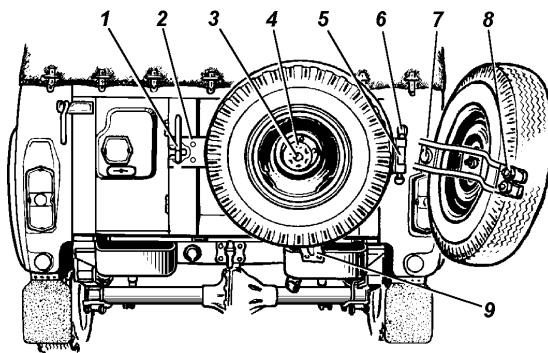


Fig. 56. Attachment of Spare Wheel:

- 1 -lock of hinged spare wheel carrier;
- 2 - hinged wheel carrier;
- 3 -bolt;
- 4 -hold-down washer;
- 5 - fixed hinge;
- 6 -wheel carrier hinge pin;
- 7,8 -buffers;
- 9 -support

With the normal tyre inflation pressure the toe-in of the front wheels should be such that the dimension "A" (Fig. 57) measured by the center line of side surface of the tyres ahead of the axle is 1.5-3.0 mm less than the dimension "B" measured back of the axle. As required, adjust the toe-in of the front wheels by changing the length of the steering tie rod; then, having loosened lock nuts 1 and 3 (Fig. 58) provided with the right- and left-hand thread, rotate adjusting sleeve 2 (Fig. 58) to set a required value of the toe-in. Upon adjustment, tighten the lock nuts.

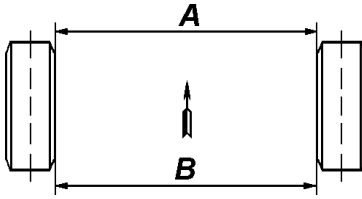


Fig. 57. Toe-In of Wheels

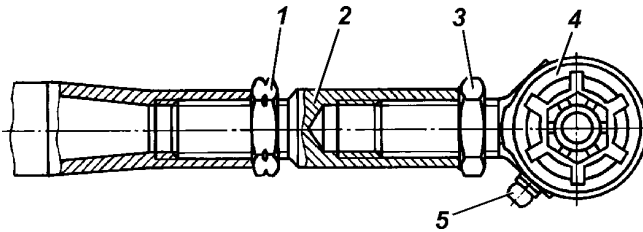


Fig. 58. Steering Linkage Rod:

1 -locknut with l.h. thread; 2 -adjusting sleeve; 3 -locknut with r.h. thread; 4 - joint; 5 -grease fitting

To provide uniform wear of tyres, carry out tyre rotation as a preventive treatment.

When rotating the cross-ply tyres, introduce the spare wheel tyre into the rotation if its wear does not differ from wear of the other tyres (Fig. 59).

When rotating the radial-ply tyres, rotate the front and rear wheel tyres separate for each side. Do not introduce the spare wheel tyre.

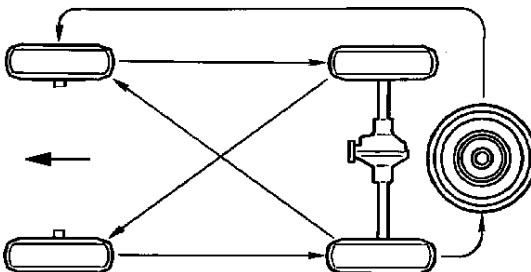


Fig. 59. Tyre Rotation Diagram

## Wheel Hubs

The hub design is illustrated in Fig. 49, 50, 60.

Maintenance of the wheel hubs consists in checking the wheel hub bearings for tightening and, if required, in their adjusting, in checking the fasteners of the axle shaft flanges and hub driving flanges.

Rock a jacked-up wheel to detect play in bearings.

Pay special attention to correct adjustment of the wheel hub bearing on a new automobile.

Change grease in compliance with Lubrication Table. For changing grease, remove the hub from the spindle, remove old grease and thoroughly wash the bearings and lubricate them. Apply 10-15 mm grease between the bearings. Do not apply too much grease to the hubs to avoid its ingressing in the wheel brakes.

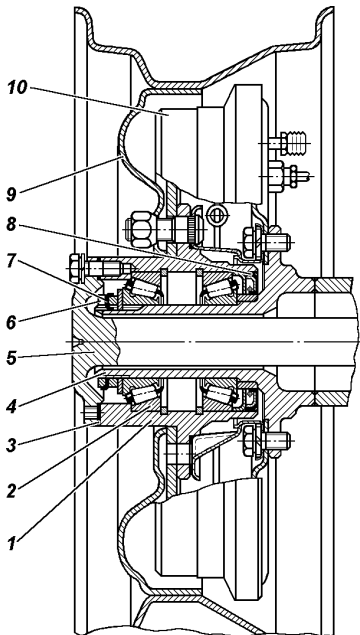


Fig. 60. Rear Wheel Hub:

1 -hub; 2 -bearing; 3 -gasket; 4 -journal; 5 -axle shaft; 6 -lock nut; 7 -lock washer; 8 -collar; 9 -wheel disk; 10 - brake drum

Adjust the wheel hub bearings in the following sequence:

1. Jack up the wheel whose bearings are to be adjusted.

2. Take out the rear axle shaft 5 (Fig. 60) (remove the axle driving flange with hub drive) or remove the hub driving flange and the front axle wheel disengaging coupling.

3. Unbend the tab of the locking washer 7, turn off the lock nut 6 and remove the locking washer.

4. Back off the bearing adjusting nut  $1/6$  to  $1/3$  turn (1-2 flats).

5. Rotate the wheel by hand to check it for easy turning (the wheel should rotate freely without rubbing of the brake drum against the brake shoes

6. Tighten the adjusting nut of the hub bearings with the aid of a wrench applying a hand effort to the wrench tommy bar 300-350 mm long until the wheel is rotated with difficulty (Fig. 61). When tightening the nut, apply the effort to the tommy bar smoothly without jerks and simultaneously rotate the wheel to allow the roller to assume correct position on races of the bearings.

7. Back off the nut  $1/4$  to  $1/3$  of a turn (1.5-2 flats) and install the locking washer, screw in and tighten the lock nut.

Replace the washer if some cracks on the tabs of the locking washer are detected.

8. Check adjustment of the bearings after tightening the locking nut. If the adjustment is correct, the wheel should rotate freely, without binding noticeable axial play and wobbling.

9. Bend the one tab of the locking washer round the flat of the nut, bend the second tab round the flat of the locking nut. (Fig. 62).

10. Reinstall the axle shaft of the rear axle (driving flange) and front axle wheel disengaging coupling, install the spring washers and tighten the bolts.

After a run, check the wheel hub for correct bearing adjustment by its heating. If the hub overheats, back off the nut  $1/6$  of a turn (1 flat), observing the above sequence and rules.

When checking the bearing adjustment by hub heating, do not apply the service brakes since the hubs will be heated from the brake drums.

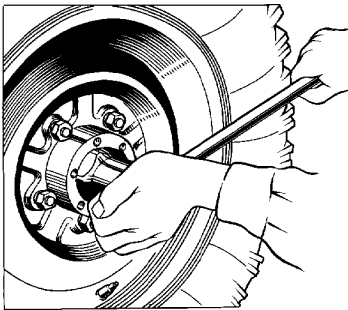


Fig. 61. Adjustment of Hub Bearings

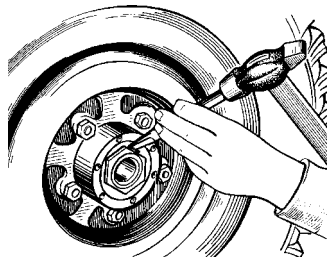


Fig. 62. Locking Hub Bearing Nuts



## CONTROL SYSTEMS

### **Steering gear**

The automobile steering gear is safe to handle in service, the splined steering shaft is provided with the cardan joint.

The automobile YA3-31512 is equipped with the steering mechanism of the "hour-glass screw and roller" type.

The automobile YA3-31512, YA3-31519, YA3-3153 are equipped with the steering mechanism of the "screw-ball nut-sector" type with the hydraulic steering booster or without it.

Maintenance of these steering mechanisms are the same, except for adjustment of the steering mechanisms and maintaining the hydraulic steering booster.

Timely tighten up the bolts attaching the steering mechanism case to the frame side member, check the pins of the steering rods and arms for proper attachment pins. Check the steering wheel play, adjust the steering mechanism, lubricate the steering linkage joints, add oil into the steering mechanism case or into the reservoir of the hydraulic steering booster.

Periodically check the steering wheel play. The steering mechanism is considered to be in serviceable condition and needs no adjustment if the steering wheel play with the wheels set in a straight-ahead position is not over  $10^\circ$  under a force of 7.35 N (0.75 kgf) applied to a dynamometer which corresponds to 40 mm when measured on the steering wheel rim.

Check the steering wheel play of the steering arrangement with the hydraulic steering booster at an idling speed with the wheels set in a straight-ahead position by turning the steering wheel in both directions until the front wheels are turned.

If the steering wheel play exceeds the above-mentioned value, check the steering case and steering column joint yokes for proper tightening, check the tie-rod joints for proper condition, check the key securing crankshaft for proper tightening and plays in joined and splined connections.

Adjust the steering mechanisms in a workshop.

Periodically check for proper tightening the lock nuts of the tie-rod tips. Do not allow any clearances in tapered joints of the levers and pins.

If radial play in the joint of the tie-rod tip is detected, turn off the plug 1 against the stop (Fig. 63), and then unscrew it by half-turn and in this position turn off it.

If knocks in the steering column (Fig. 64 and 65a) are heard, remove the steering wheel and check the circlips of the expansion bushing in the shaft grooves for proper condition. For the steering column without an antitheft device (Fig. 64), loosen first the bracket fastening nuts, pull the column upwards and check the condition of the rubber bushing. A loose attachment of the body to the frame may also result in knock in the steering column.

When knock in double-coupling steering column (Fig. 65b) is heard, check the circlip 8 in the shaft groove for proper condition, tighten up the nuts 15, 28 and adjust bearings by tightening the nut 27.

In the process of maintenance of automobiles pay attention to proper fastening of the bearings in the yokes of the steering arrangement universal joint.

Fig. 63. Steering Rod Joint:  
1 -plug; 2 -spring; 3 -pivot; 4 -lower spherical washer; 5 -upper spherical washer; 6 -protective ring; 7 -spring cap; 8 -cotter; 9,13 -nut; 10 -ball pin; 11 -block; 12 -end piece; 14 -rod

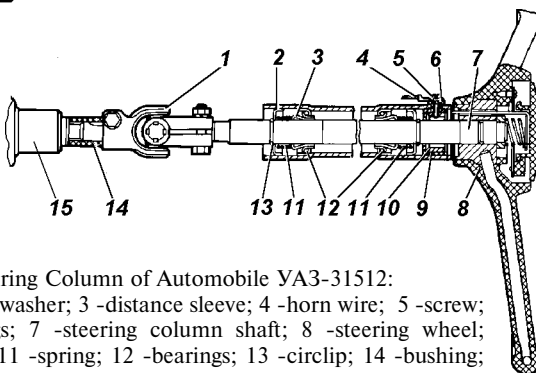
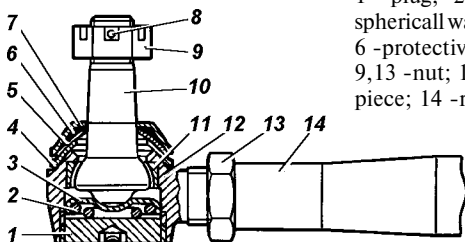


Fig. 64. Steering Column of Automobile YA3-31512:

1 -joint; 2 -protective washer; 3 -distance sleeve; 4 -horn wire; 5 -screw; 6, 9 -plastic bushings; 7 -steering column shaft; 8 -steering wheel; 10 -contact bushing; 11 -spring; 12 -bearings; 13 -circlip; 14 -bushing; 15 -steering mechanism

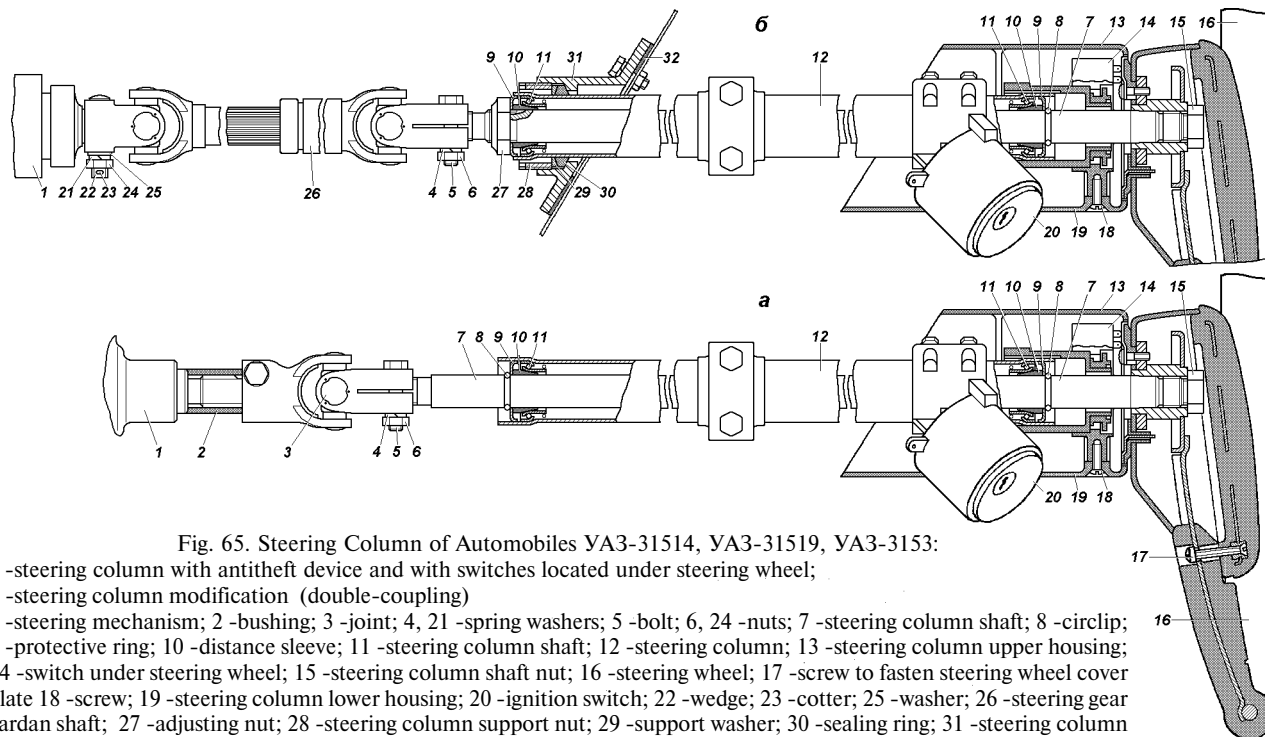


Fig. 65. Steering Column of Automobiles YA3-31514, YA3-31519, YA3-3153:

a -steering column with antitheft device and with switches located under steering wheel;

6 -steering column modification (double-coupling)

1 -steering mechanism; 2 -bushing; 3 -joint; 4, 21 -spring washers; 5 -bolt; 6, 24 -nuts; 7 -steering column shaft; 8 -circlip; 9 -protective ring; 10 -distance sleeve; 11 -steering column shaft; 12 -steering column; 13 -steering column upper housing; 14 -switch under steering wheel; 15 -steering column shaft nut; 16 -steering wheel; 17 -screw to fasten steering wheel cover plate; 18 -screw; 19 -steering column lower housing; 20 -ignition switch; 22 -wedge; 23 -cotter; 25 -washer; 26 -steering gear cardan shaft; 27 -adjusting nut; 28 -steering column support nut; 29 -support washer; 30 -sealing ring; 31 -steering column support; 32 -seal

If radial play in the joint (axial displacement of the center cross in the bearings) is detected, carry out an additional stop-punching of the bearings in the yoke eyes. During stop-punching do not allow the crumpling of the bearing body.

Radial displacement of the splined bush of the cardan shaft 26 (Fig. 656) is allowed, if there is no a perceptible side play in splines.

During assembly, the bearings of the universal joint center cross are prepacked with grease Литол-24 and there is no need in addition of grease in the service period.

### Maintenance of the Steering Gear with Hydraulic Steering Booster

In case of failure of the hydraulic steering booster due to damage of the pump, deterioration of the hose or the pump drive belt or during towing of the automobile due to engine stop, the steering mechanism could be operated only a short period of time. **A prolonged operation of the automobile with the non-operating hydraulic steering booster would cause preliminary wear of the steering mechanism.** Do not allow that the pump of the hydraulic steering booster functions without oil. When leakage of oil from the hydraulic steering booster is detected, the belt of the hydraulic steering booster drive is to be removed.

**Belt tension of the hydraulic steering booster pump drive.** At a normal belt tension, its deflection in the middle between the crankshaft pulleys and pump pulleys should be equal to 12-17 mm when a force of 39 N (4 kgh) is applied to the belt. If required, adjust the belt tension by shifting the pump along the bracket attaching it to the engine. To do this, back off bolts attaching the pump to the bracket, shift the pump by means of the adjusting screw until a normal tension would be achieved and tighten up the bolts.

In case of failure of the belt or its excessive tension, replace the belt.

**Checking oil level and changing oil in hydraulic steering booster.** When checking oil level in the oil reservoir, set the front wheels in the position corresponding to the straight-ahead motion of the automobile. Refill oil when idling until oil reaches the level of the filler filter gauze in the oil reservoir or 5 mm higher, but not more.

Filtrate oil preliminarily using a filter with absorption trap not more than 40  $\mu\text{m}$ .

Oil filling capacity is 1.1 l.

Change oil and replace the filter in the oil reservoir every 100 000 km of run or every two years of service. Change oil also when repairing or adjusting the steering mechanism.

Fill up the hydraulic steering booster as follows:

1. Uncouple the pitman arm drag link from the pitman arm or hold wheels off the ground by means of a lifter.

2. Remove the oil reservoir cover, fill up oil until it would appear over the filter gauze (not more than 5 mm).

3. Without starting the engine, turn the steering wheel or steering mechanism output shaft from lock-to-lock position until air bubbles cease to escape from the oil reservoir. Refill oil.

4. Start the engine simultaneously refilling oil.

**Note.** Excessive foaming of oil in the reservoir indicates that air is inside of the system. In this case, stop the engine and settle oil for 20 minutes minimum (until air bubbles cease to escape from oil). Check connections of hoses to the hydraulic steering booster units for tightness and eliminate untightness if required.

5. Run the engine for 15-20 s and bleed the hydraulic steering booster by turning the steering wheel from lock-to-lock position without holding it in extreme positions, three times in each direction.

6. Top up oil if required.

7. Place the reservoir cap and tighten the cap nut by hand.

8. Couple the pitman arm drag link, tighten and secure the ball pin nut with a cotter.

**Maintenance of the by-pass and safety valves.** When the by-pass and safety valves are dirty, wash them out. For this:

1. Screw out the stopper plug 9 (Fig. 66) over the inlet hole of the pump.

2. Take out the spring 5 and the control valve core 1, and place the stopper plug to prevent flowing out oil.

3. Unscrew the safety valve seat 6, take out the ball 4, the guide 3 and the spring 2. Take out the ring 8 and the filter 7 from the safety valve seat.

4. Wash the parts and blow them out with compressed air.

5. Carry out assembly in the reverse order. Keep cleanness when assembling. When disassembling and assembling, do not

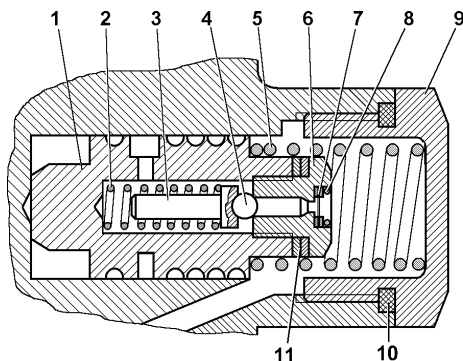


Fig. 66. By-pass and Relief Valves of Pump:  
 1 -control valve of by-pass valve ; 2 -relief valve spring; 3 -guide of relief valve spring; 4 -relief valve ball; 5 -control valve spring ; 6 -relief valve seat; 7 -filter; 8 -ring; 9 -plug-stopper; 10 -sealing gasket; 11 -adjusting shims

change the number of the adjusting shims 11 in order not to disturb the adjustment of the safety valve.

## Brake System

### Maintenance of the Service Brakes

Periodically check the fluid level in the brake master cylinder reservoirs and top up if required (Fig. 67). The level should be 15-20 mm below the filling hole upper edges. Make sure of the hydraulic brake system tightness. Check the pipelines for condition and reliable attachment to the frame and rear axle .

Do not operate the automobile when the pipes and hoses are faulty.

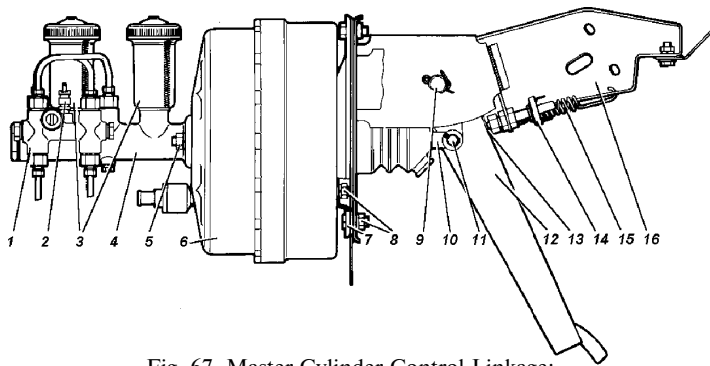


Fig. 67. Master Cylinder Control Linkage:

1 -signalling device; 2 -brake hydraulic system emergency condition warning lamp switch; 3 -reservoirs; 4 -brake master cylinder body; 5,8 -nuts; 6 -vacuum booster; 7 -plate; 9 -brake pedal shaft; 10 -fork; 11 -pin; 12 -brake pedal; 13 -stop; 14 -stop-light switch; 15 -return spring; 16 -bracket

If one of the hydraulic brake circuits is a failure, the warning lamp on the instrument panel lights up.

Periodically remove the brake drums and clean the brake parts of dirt. Periodicity of this operation depends on service conditions of the automobile. In the summer season and when driving on mud-covered roads, carry out cleaning more frequently.

Check the pressure regulator\* for serviceability during seasonal maintenance. Clean the pressure regulator of dirt and check it for proper fastening. Visually make sure that the regulator and the parts of its drive are not faulty, and also make sure that there is no leakage of brake fluid and there are no backlashes between the post complete with resilient lever and the bracket of the rear axle.

When pressing the brake pedal, the regulator piston should be extended from the regulator body by 1.7 - 2.3 mm. No piston stroke and also its deficient or excessive stroke indicate that the regulator or its drive is damaged.

When maintaining the hydraulic steering system, pay attention to the stopper 17 (Fig. 68) and check, if there is no leakage of brake fluid from under it. The plug in its service condition must be flushed with the opening of the regulator body against the stop. If the stopper is extended above the opening, and brake fluid leaks, repair or replace the regulator.

In the service period, when replacing the rear springs, adjust force of the toggle 5 (Fig. 69) on the regulator piston. Carry out the adjustment in the following sequence:

1. Place the automobile ready for driving on a level ground.
2. Loosen the lock nut of the adjusting bolt and back out the bolt through 2-3 of a turn.
3. Screw the bolt 4 until it touches the regulator piston 1 (Fig. 68), draw the bolt tight through 2/3 of a turn (4 bolt flats) and tighten the lock nut.
4. Check the regulator piston stroke (see above).
5. With the automobile in motion, check the adjustment for correctness. To this end, brake the automobile until locking the wheels, when driving on a straight level dry asphalt road. When the regulator is serviceable and the adjustment of the drive is

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\* Installed on some automobiles

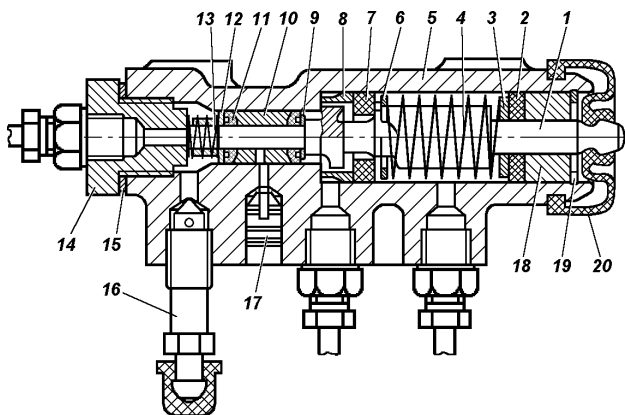


Fig. 68. Pressure Regulator:

1 - piston; 2 - piston sealing ring; 3,6 - piston spring bearing disk; 4 - piston spring; 5 - body; 7 - piston head seal; 8 - body liner; 9 - pusher sleeve bearing disk; 10 - pusher sleeve; 11 - pusher sealing ring; 12 - bearing plate; 13 - pusher sleeve spring; 14 - plug; 15 - plug gasket; 16 - by-pass valve; 17 - stopper; 18 - piston bushing; 19 - stopper ring; 20 - boot

done correct, the front wheels are locking first than the rear ones. If the rear wheels are locking first, unscrew the bolt 4 through 1-2 bolt flats and repeat checking with automobile in motion.

During service, keep close watch on the brake system serviceability, timely perform its adjustment and eliminate defected faults.

For restoring the normal clearances between the brake shoes and drums and for reducing the brake pedal travel, adjust the brake drum-to-shoe in the following sequence:

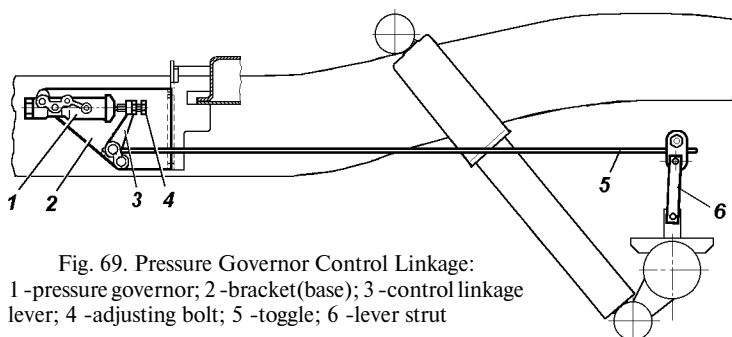


Fig. 69. Pressure Governor Control Linkage:

1 - pressure governor; 2 - bracket(base); 3 - control linkage lever; 4 - adjusting bolt; 5 - toggle; 6 - lever strut



1. Jack up the wheel which brake is to be adjusted.
2. Check the adjustment of the wheel hub bearings for correctness and carry out the adjustment, if required, as indicated in the section "Wheel Hubs".
3. Rotate the wheel and gradually turn the adjusting eccentric 19 (Fig. 70) or 4 (Fig. 71) until the wheel is braked (Fig. 71).
4. While rotating the wheel, gradually back out the eccentric until the wheel starts rotating freely, without brushing of the drum against the brake shoes.
5. Similarly, adjust the drum-to-shoe clearances in the remaining brakes.

When adjusting the brakes of the front wheels and the front shoes of the rear wheel brakes, rotate the wheel forward. When adjusting the rear shoes of the rear wheel brakes, rotate the wheel backward.

For reducing the clearance, turn the eccentric in the direction of the wheel rotation and for increasing the clearance, rotate the eccentric in the reverse direction.

6. Make a road test to check the brakes for drum heating and for uniform application.

During the brake running adjustment, do not touch the anchor pins as the Manufacturer's setting of the brake shoes will be disturbed.

If the rivets of the linings are flush-mounted on a depth of less than 0.5 mm, replace the shoes or linings.

Adjust **the brake pedal free travel** by setting the stop of the stop-light switch 14 (Fig. 67) in a position ensuring the free travel of brake pedal in a range of 5 - 14 mm. Check the brake pedal free travel when the engine is shut down.

**Fill the brake hydraulic system in the following sequence:**

1. Check all the connections of the brake hydraulic system for leaks and the flexible hoses for proper condition.
2. Clean of dust the brake master cylinder reservoir surface round the cap and unscrew the cap. Fill up the reservoir with brake fluid.
3. Remove the cap from the by-pass valve of the brake master cylinder or from the pressure regulator and put the end of a rubber hose, about 400 mm long on the by-pass valve.

Dip the other end of the hose in a glass vessel of at least 0.5-l capacity half filled with brake fluid (Fig. 72).

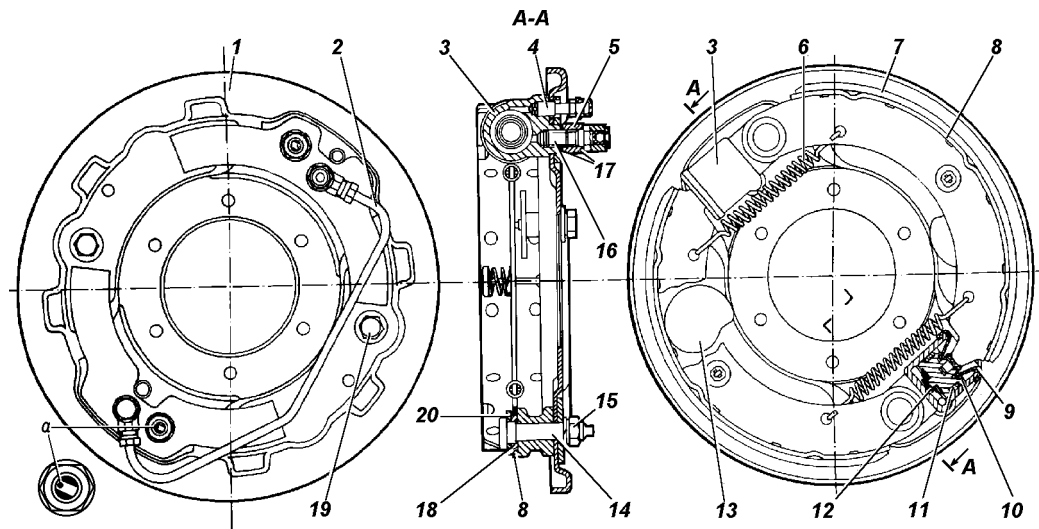


Fig. 70. Front Wheel Brake:

1 -brake backing; 2 -bridge pipe; 3 -wheel cylinder; 4 -bleeder valve; 5 -coupling; 6 -shoe return spring; 7 -brake shoe lining; 8 -brake shoe; 9 -boot; 10 -piston; 11-sealing ring; 12 -piston spring; 13 -adjusting eccentric; 14 -anchor pin; 15 -nut; 16 -coupling bolt; 17 -gaskets; 18 -support bushing; 19 -adjusting eccentric bolt; 20 -washer

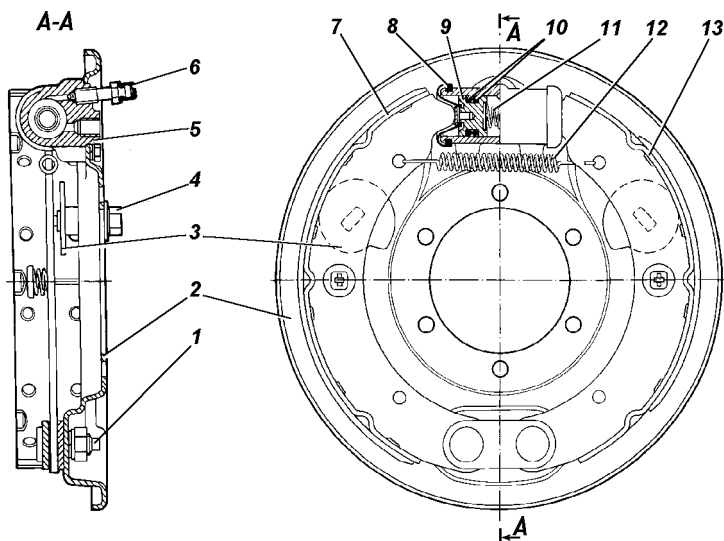


Fig. 71. Rear Wheel Brake:

1 -marks on anchor pins; 2 -brake backing plate; 3 -adjusting eccentric; 4 -eccentric bolt; 5 -wheel cylinder; 6 -bleeder valve; 7,13 -brake front shoes; 8 -boot; 9 -piston; 10 -sealing ring; 11 -piston spring; 12 -return spring

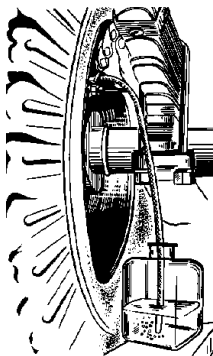


Fig. 72. Bleeding Brake System

4. Screw out the by-pass valve through  $1/2 - 3/4$  of a turn, then press the brake pedal several times. Depress the pedal quickly and release it slowly.

Under pressure of the brake master cylinder piston, brake fluid fills the hydraulic system and forces out air. Perform the bleeding procedure until air bubbles cease to escape from the hose dipped in the vessel with brake fluid. In the process of bleeding, add brake fluid into the reservoirs of the brake master cylinder seeing to it that they are never empty in order to prevent penetration of air into the system again.

During the whole operation, keep the free end of the hose dipped in fluid. If neither fluid nor air escape from the hose, the hose is clogged or the valve is closed.

5. With the brake pedal pressed down, tightly screw in the by-pass valve of the wheel brake cylinder, remove the hose and put the cap on the valve.

6. Bleed in the following sequence: the r.h. brake wheel cylinder and the l.h. brake wheel cylinder of the rear brakes, the front circuit of the pressure regulator, the r.h. brake wheel cylinder and l.h. brake wheel cylinder of the front brakes.

7. After all the brakes have been bled, add brake fluid into the brake master cylinder reservoirs.

Screw on the caps of the reservoirs.

8. Switch off the brake warning device for which purpose, do as follows:

- screw out the by-pass valve of the r.h or l.h. wheel brake cylinder of the rear brakes;

- smoothly press the brake pedal until the warning lamp on the instrument panel goes out; if the warning lamp flashes, this means that the signalling device pistons are passed over the neutral position and it is necessary to repeat the operation by unscrewing the by-pass valve of the front wheel.

- screw in the by-pass valve with the brake pedal depressed.

Switch on the signalling device brakes and their hydraulic system have been adjusted and bled correctly, the full application of the brakes should take place within  $1/2 - 2/3$  of the pedal travel.

Do not add into the brake master cylinder the brake fluid collected in the glass vessel during bleeding.

Do not depress the brake pedal with the brake drum removed because due to pressure in the hydraulic system, the pistons will be forced out of the wheel brake cylinders and the fluid will flow outside.

Change brake fluid once every two years for proper functioning of the brakes. When changing fluid, fill up the system until fresh fluid will escape from the hose.

### **Maintenance of the Parking Brake**

Maintenance of the parking brake comes to periodic checking the parking brake mechanism and its control linkage for proper condition and for reliable fastening, cleaning of dirt, adjusting, lubricating the expander and adjuster and eliminating defects, if required.

Periodically disassemble the expander, clean it of dirt and

pack with fresh grease, making sure grease does not get on the drum and friction linings. When disassembling the parking brake mechanism, clean the brake shoes of dust and dirt and also check the friction linings for proper condition. Replace the shoes or linings, if the rivets are flush-mounted on a depth less than 0.5 mm.

Complete braking of the automobile should be insured when the pawl of the parking brake lever is in the third or fourth notch of the sector (3-4 clicks).

**Do not allowed** to check the parking brake for proper condition when starting away from rest or with automobile in motion. Check the parking brake only on a downhill.

Increased travel of the parking brake lever in the service period may be caused either by large clearance between the brake shoes and drum (in which case, adjust this clearance) or by an excessive free play in the control linkage (in which case, adjust the length of the control rod).

To adjust the brake shoe-to-drum clearance, turn in the screw 7 (Fig. 73) on the brake anchor plate, and then turn out the screw against the stop through 4-6 clicks ( $1/3$ - $1/2$  of a turn) until the drum is free to rotate.

Adjust the length of control rod in the following sequence:

1. Shift the lever to the extreme forward position.
2. Screw off lock nut of adjusting fork 1, uncotter and take out the pin securing fork to control lever.
3. Rotate the adjusting fork to take up all plays in the control linkage.
4. Give the adjusting fork 1.5-2 turns out, align the holes in the fork and lever, insert and cotter the pin and tighten the lock nut.

## **ELECTRICAL EQUIPMENT**

See wiring diagrams of automobiles in Appendix 4.

### **Maintenance of the Alternator**

The automobiles could be provided with the alternator with a built-in rectifier operating in conjunction with a voltage regulator. The automobiles could be equipped with alternators of two types:

- 665.3701-01 or 161.3771 - with brush assembly;
- Г700А.30 или 957.3701-10 - without brushes.

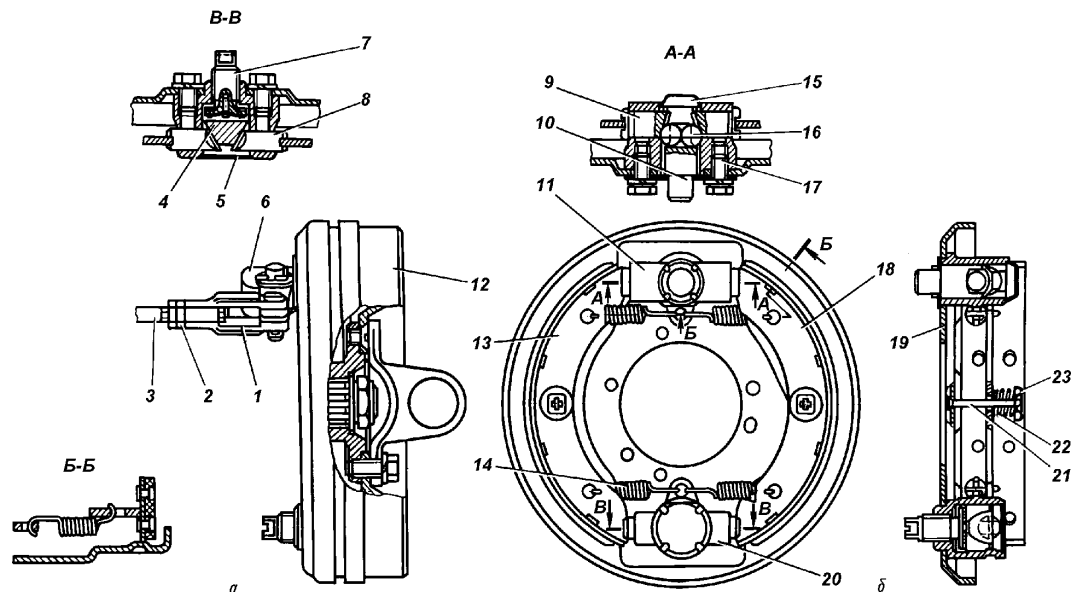


Fig. 73. Parking Brake:

1 -adjusting fork; 2 -lock nut; 3 -cable end; 4 -expanding cone; 5 -blank cover; 6 -operating lever; 7 -adjusting screw; 8 -brake shoe support; 9 -expander mechanism pushrod; 10 -cage of balls; 11 -expander mechanism housing; 12 -brake drum; 13,18 -brake shoes; 14 -brake shoe return spring; 15 -cap; 16 -expander mechanism ball; 17 -bolt; 19 -brake backing plate; 20 -adjusting mechanism housing; 21 -rod; 22 -spring; 23 -spring retainers

a - view with brake drum; б - view without brake drum

Check the alternator function in accordance with ammeter reading. When the ignition and the engine are off, the ammeter shows the voltage across the battery terminal, and after the engine starting - the voltage across the alternator terminal.

The voltage across the alternator terminal should be 13.6 - 14.7 V.

If the voltage is increased, check the alternator or the voltage regulator and eliminate the defect.

The built-in integral voltage regulators are not repaired. In case of breakage of the regulator replace it for the regulator of the same type.

Periodically check the brush assembly and the contact part of the integrated voltage regulator for proper condition. To do this, remove the alternator 665-3701 from the automobile, and remove the brush assembly on the alternator 161.3771. Replace worn-out brushes.

### **Maintenance of the Storage Battery**

The storage battery is installed on the bracket under the hood.

The storage battery is connected parallel to the alternator. If in the service period of the automobile, the storage battery is gradually discharging or is excessively charging by the alternator, and the electrolyte begins to gas, check the alternator for proper condition.

Keep the storage battery clean and in charged state, protect its leads and terminals from oxides as indicated in Lubrication Table.

Periodically clean vent holes in plugs, check the electrolyte level and, if required, add distilled water.

Check the electrolyte level in each battery cell on a cold battery and if necessary, add distilled water up to the lower end of the filler hole tube.

Before operation, depending on the climatic condition under which the automobile is to be employed, correct the electrolyte specific gravity.

New automobiles delivered from the manufacturing plant are furnished with the storage batteries filled with electrolyte of the same specific gravity equal to 1.27 g/cm<sup>3</sup>.

The battery discharged by more than 25% in winter and more than 50% in summer is to be charged.

### **Specific gravity of electrolyte reduced to 25 °C, g/cm<sup>3</sup>**

Fully charged battery	Battery discharged by	
	25%	50%
1.30	1.26	1.22
1.28	1.24	1.20
1.27	1.23	1.19
1.26	1.22	1.18
1.23	1.19	1.15

Do not allow discharging the battery under a heavy load current for a prolonged period of time (when starting cold engine in winter) because it could provoke curling of electrodes, falling-out of active material and reduces service life of the storage battery.

Carefully prepare the engine for starting and switch on the starter for 5 s maximum.

Cut off the battery by means of the ground switch if the automobile is to be removed from operation for a prolonged period of time.

### **Maintenance of the Starter**

Before removing the starter for servicing open the battery switch.

Periodically clean the starter of dirt, visually check the starter for proper attachment to the clutch housing.

Check the condition of terminals, working surfaces of contacts, remove caking with a fine cut file, then wipe them with waste and blow out. Check the starter drive, its pinion, lever and spring.

Clean of dirt frictioning parts, wash out and wipe them dry, if required, lubricate with grease "Литол-24".

Check axial play of the rotor shaft which should be not more than 1.0 mm. If required, tighten up bolts of the starter frame.

The starter drive is to be freely shifted along the shaft splines and returned to its initial position by means of the return spring. The rotor should not be rotated when rotating the drive pinion in the direction of working rotation. Check the rotor by hand for easy rotating in bearings when brushes are risen up. Replace the brushes if their length is less than 6 mm.



**Warnings:** 1. The overrunning clutch of the starter could be failed if the starter is keeping on after starting the engine.

2. Do not wash the starter covers and drive with gasoline or kerosene to avoid washing out grease out of bronze-graphite oilless sliding bearings.

## **Lighting System, Light Flashers and Horn**

**Maintenance of the headlamps** amounts to their aiming and replacing defective lamps, cleaning of dust from the headlamp body and lens.

In spite of the good sealing, dust may penetrate into the sealed beam unit. For removal of dust, wash the sealed beam unit with clean water and a cotton wad, and dry at a room temperature.

For replacing the bulb in the headlamp, turn out screw 1 (Fig. 74) securing garnish molding 2 and remove it. Loosen three screws 5 and take out inner molding 4 together with the sealed beam unit 3.

Perform aiming of the headlamps in the following sequence:

1. Place ready for road automobile with a driver's seat load of 75 kg. on a level ground. Erect the aiming screen in front of the automobile at a distance of 5 m. Remove the rims.

2. Switch on the headlamp and by operating the foot switch be sure that the lower and upper beams are lighting up simultaneously.

3. Turn on the lower beam and cover one headlamp. Adjust the beam by turning the screws 6 (Fig. 74) until the area of the concentrated light corresponds with the marks on the aiming screen or the wall as indicated in Fig. 75. The adjusting screws of the headlamp 62.3711-09 are located symmetrical about the headlamp center in the horizontal plane.

4. Adjust the second headlamp in the same manner ensuring that the upper edges of concentrated lights are at the same height.

5. Fasten the rims.

**Adjust the fog lamps** that the area of concentrated light on the aiming screen or the wall is located as indicated in Fig. 76. For replacing the fog lamp bulb, remove the cover of the bulb holder by turning it counterclockwise and take out the bulb.

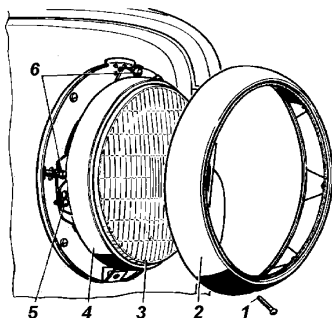


Fig. 74. Headlamp:  
1,5 -screws; 2 -garnish molding;  
3 -sealed beam unit; 4 -inner  
molding; 6 -adjusting screws

**Front headlamps, rear lamps, backing lamp, side turn indicator repeaters, rear fog lamp.** For replacing the lamps, undo screws attaching the lens and remove it.

**License plate lamp.** For replacing the lamp, undo the screw attaching the cover, remove the cover and the lens.

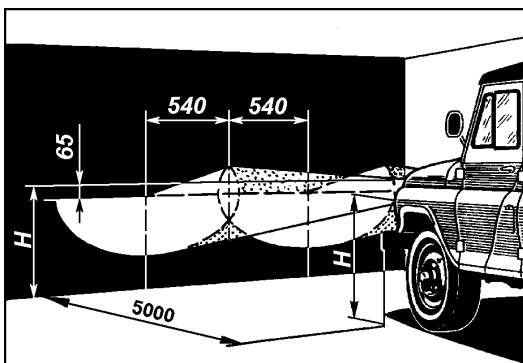


Fig. 75. Aiming  
Screen for  
Headlamp Adjust-  
ment:  
H - distance from  
center of headlamps  
to ground level

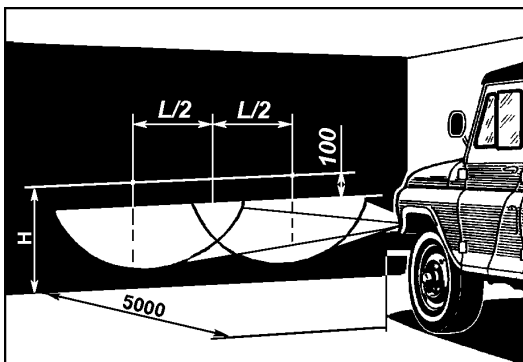


Fig. 76. Aiming  
Screen for Fog  
Headlamp Adjust-  
ment:  
H - distance from  
center of headlamps  
to ground level  
L - distance between  
centers of fog head -  
lamps

**Maintenance of the horn** amounts to periodic checking it for proper fastening, tightening the wire clamps, cleaning of dirt and dust, and also to checking the sound intensity and adjusting, if required.

Adjust the horn in a workshop.

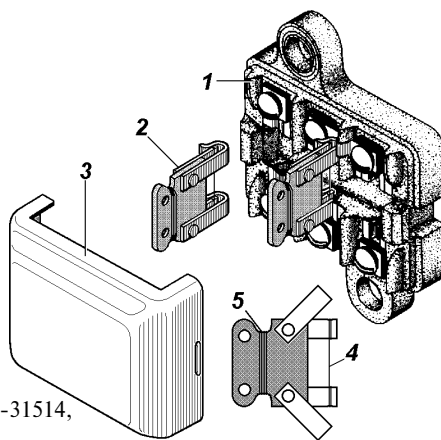
**Turn indicators.** The turn indicators are switched on manually by means of the switch and switched off automatically.

Maintenance of the turn indicators of the automobile YA3-31512 comes to insuring a clearance of 2-2.5 mm between the rubber roller of the switch and the hub of the steering wheel with the switch lever set in the neutral position. Adjust the clearance by moving the switch along the bracket. Shift the switch lever from one into another position smoothly without jerks and blows. Take care to prevent getting of lubricant and water on the switch rubber roller and keep the roller clean.

### Overload Breakers

The unit of overload breakers (Fig. 77) provided with three fuses 10A each is located under the automobile hood, on the body front panel.

Fig. 77. Fuse Unit:  
1 -fuse unit body; 2 -fuse link;  
3 -body cover; 4 -fuse link  
filament; 5 -reserve filament



#### Circuits to be protected

Automobiles YA3-31512, YA3-31514,  
YA3-31519:

№1 - turn indicators, backing lamp;

№2 - driving controls, light flashers

№3 - turn indicators in emergency warning mode, horn;

Automobile YA3-3153:

№1 - heater motor, backing lamp;

№2 - turn indicators, driving controls, light flashers, upper and lower beam lamp relay

№3 - turn indicators in emergency warning mode, horn

The thermal pushbutton cut-out 24 protects the lighting circuit (see Fig. 9, 10, 11).

The fuse (16A) protects the cigarette lighter circuit. The fuse is mounted in the wire bundle under the instrument panel near to the cigarette lighter.

The fuse (6A) protects the heater motor circuit of the automobiles YA3-31512, YA3-31514, YA3-31519. The fuse is mounted in the wire bundle under the instrument panel from the left of the heater.

The fuse (10A) protects the fog lamp circuit of the automobile YA3-3153. The fuse is mounted in the wire bundle in the engine compartment on the body front panel near to the fog lamp relay

Before replacing the worn-out filament of the fuse link or before switching off the thermal pushbutton cut-out, determine the cause of overloading and eliminate defects.

### **Instrumentation and Warning Flashers**

Instrumentation and warning flashers are intended to keep watch on the condition and function of some mechanisms and units in the automobile. They consists of: speedometer, voltmeter, oil pressure gauge, engine coolant gauge and fuel level gauge. The gauges operate in conjunction with transmitters.

The automobile is provided with the automobile emergency condition warning flashers (all the turn indicators flush simultaneously).

**Maintenance of the devices** comes to periodic checking the devices for proper attachment, terminal connections for proper condition, cleaning them of dust and dirt.

Before removing the electric transmitters, insulate the end of a lead in order to prevent a short circuit. For removing the transmitters, use a box wrench or hexagon wrench to avoid damage of the transmitter body.

Do not allow a drop of the coolant level in the radiator, as it may cause failure of the temperature transmitter.

Check the coolant temperature gauge for proper reading once a year. To do this, immerse the transmitter into hot water and measure its temperature by means of the test thermometer.

Check the oil pressure gauge and oil emergency pressure warning light transmitter for proper reading by means of the test pressure gauge once a year.

Check the flexible shaft for proper installation. The flexible shaft should be installed in that way that the radius of bending would be not less than 150 mm.

### SPECIAL TOOLS AND APPLIANCES

New automobiles delivered from the manufacturing plant are provided with a set of tools and appliances. Use this set for maintenance and simple repair of the automobile en route. For convenience of storage, there are two tool bags in the automobile: a big and a small one.

Use a plunger grease gun (Fig. 78) for lubricating the automobile assemblies provided with nipples.

For lubricating, pull the handle 12 until the stud 13 touches the piston 7; by rotating the handle insert the stud through slot of the piston and by rotating the handle lock the stud in the piston, fit the head 1 over a nipple. When rocking the lever 8, press the handle 12.

#### **Fill the gun with grease in the following sequence:**

1. Screw the cylinder 9 out of the body 4.
2. Pull the piston 7 inside of the cylinder through 1/5 of strokes by means of the handle 12.
3. Using a wood spatel, fill the gun cylinder with grease. Then press the piston against the stop and fill the whole cylinder with grease. Make sure, there are no air bubbles in the cylinder.

The gun fails to be operated if air would find its way into the chamber B.

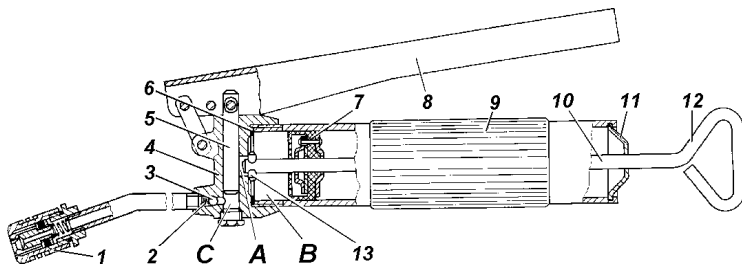


Fig. 78. Grease Plunger Gun:

- 1 -head; 2 -spring; 3 -ball valve; 4 -body; 5 -plunger; 6 -gasket; 7 -piston; 8 -lever; 9 - gun cylinder; 10 -rod; 11 - cover; 12 -handle; 13 -stud

For deaerating, unscrew the bolt of the cylinder C, press the gun handle until grease is emerged and tighten the bolt.

The capacity of the chamber B is 340 cm<sup>3</sup> of grease.

**The Jack** (Fig. 79) is designed to jack up the automobile wheels for maintenance. The jack load-lifting capacity is 2 t. The maximum height of lifting is 240 mm.

**For jacking up the wheel, proceed as follows:**

1. Install the jack on a level ground under the axle shaft sleeve.

2. Turn out the jack internal screw 3 as high as the clearance between the axle shaft sleeve and the ground permits.

3. Throw over the jack latch 5 to the l.h. side relative to the jack handle 6 so that the latch projection enters the tooth space of the ratchet wheel 7.

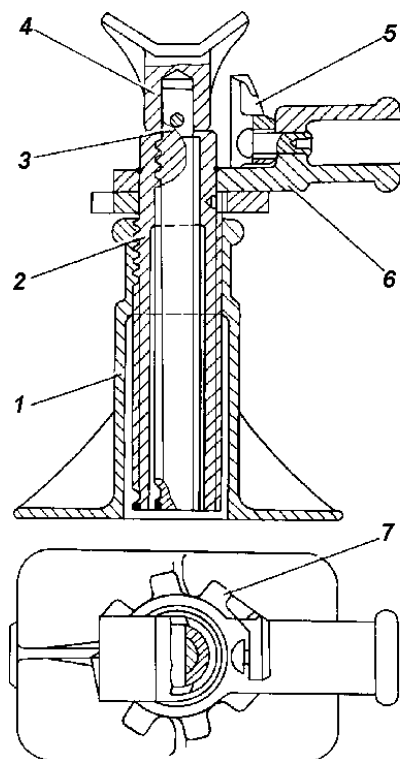


Fig. 79. Jack:

1 -body; 2 -external screw;  
3 -internal screw; 4 -head;  
5 -pawl; 6 -handle; 7 -ratchet

4. By stroking the tyre iron inserted on the hole of the jack handle, lift the automobile wheel to a required height.

For jacking down the wheel, throw over the jack latch to the r.h. side and by stroking the tyre iron, jack down the wheel. After work is over, turn the internal 3 and external 2 screws in the jack body as far as they will go.

**Maintenance of the jack** amounts to periodically cleaning it of dirt and lubricating the external and internal screws.

## **BODY**

The automobile body is of a metal multipurpose open type provided with detachable soft (tarpaulin) top, four doors, a hinged tailgate and is adapted for carrying passengers and cargoes.

The flap door of cargo compartment which is fixed in the upper position by means of the stops.

The doors and body tail gate are removable.

The door locks and handles are of safe type. The front door locks are locked up by a key. The internal door panels are provided with handles 2 (Fig. 80); by means of these handles, the door locks are locked up from inside (the lower handle position).

**The locks locked up from inside by means of the handles 2 are not unlocked from outside.** The lock of the flap door is locked up by a key.

The body floor is provided with access hatches to the transmission, transfer box, parking brake, as well as to the sensors and intake pipes of the fuel tanks. The hatches are closed by doors with rubber seals and are held to the floor by bolts.

For accommodation of filler necks of the fuel tanks the center pillars of the body are provided with hatches having hinged doors (Fig. 81).

There are boxes for oil reservoir, tow etc. in the rear body compartment.

It is possible to install a box for papers with lid detachable upwards on the body floor between front seats. The cowl parts of the body, radiator shell, fenders, mud guards, hood are removable (Fig. 82).

The windshield frame is hinged to the body and is secured by locks. When the tarpaulin is removed, it may be hinged out onto

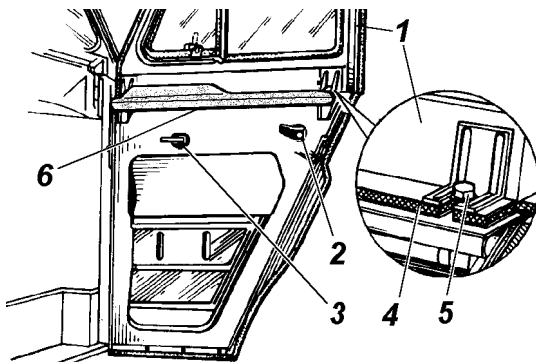


Рис. 80. Automobile

Door:

1 -door extension; 2 -  
door lock inner  
handle; 3 -door lock  
outer handle; 4 -gas-  
ket; 5 -extension fas-  
tening bolt; 6 -armrest

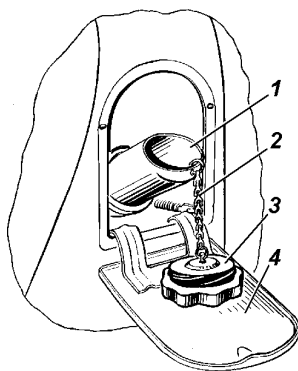


Fig. 81. Fuel Tank Filler Neck:

1 -extending pipe; 2 -chain; 3 -fuel tank  
filler cap; 4 -access door

the hood and strapped to it. The windshield blades with levers should be removed.

For access to the engine the hood could be set in two positions (Fig. 83).

A detachable tarpaulin is secured on a metal knock-down framework (Fig. 84).

The metal frame work integrates with the safety bows.

**To disassemble the tarpaulin, proceed as follows:**

1. Unfasten the tarpaulin from the rear part of the body and from the body sides, and thereafter remove the tarpaulin from the fasteners.

2. Screw out the extreme bolts securing the metal holding-down strips located on the windshield frame, ease off the remaining bolts and remove the metal hold-down strips.



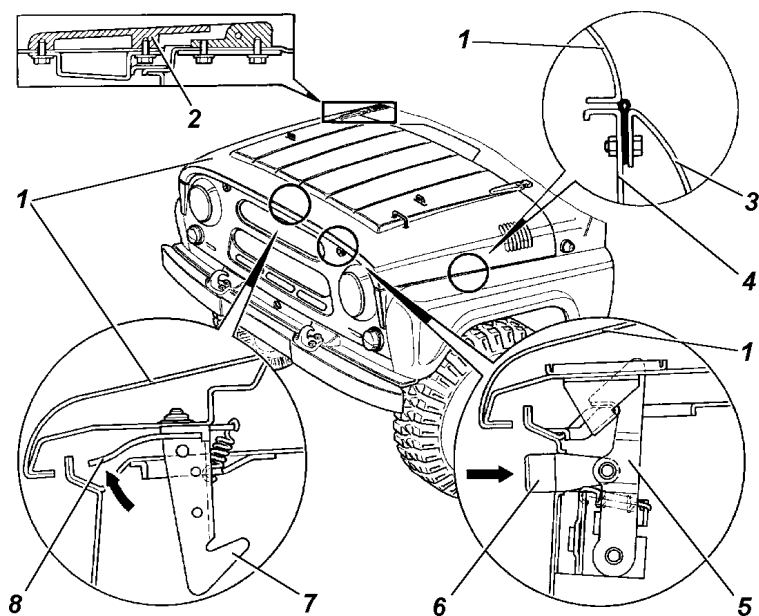


Fig. 82. Hood Lock and Safeguard:

1 -hood; 2 -hood hinge; 3 -fender; 4 -wheel mud guard; 5 -hood lock hook;  
6 -hood lock button; 7 -hood safety catch; 8 -hood safety catch lever

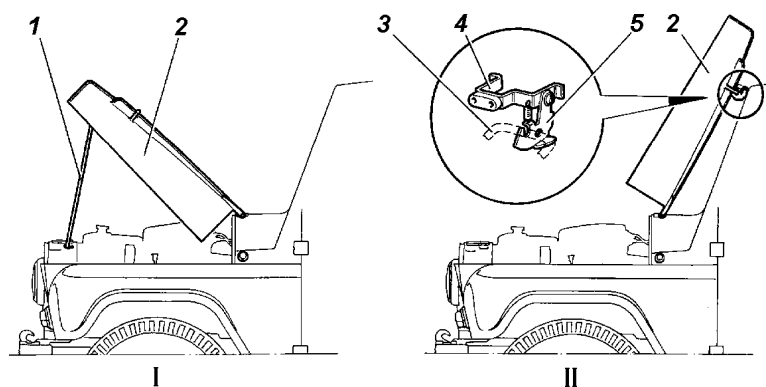


Fig. 83. Setting Hood in Open Position:

I -hood in propped-up position; II -hood latched to windshield frame; 1 -hood  
prop; 2 -hood; 3 -hood retainer clamp; 4 -hood retainer bracket; 5 - hood retainer  
latch

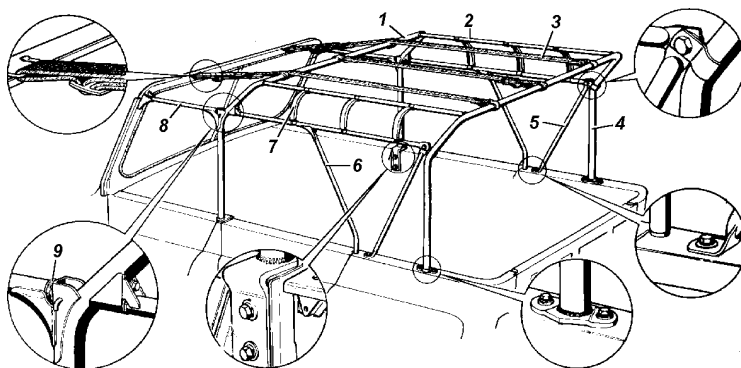


Fig. 84. Body Tarpaulin Frame:

1 -front bow; 2 -bow rear tie; 3 -fixing strap; 4 -rear bow; 5 -brace; 6 -inclined strut; 7 -spring strut; 8 -bow front tie; 9 -rubber bushing

3. Open the door and release the tarpaulin.

4. Remove the tarpaulin from the bolts of the windshield frame and from the hooks of the tarpaulin framework front bow. Remove the tarpaulin from the framework and stow it in a clean place.

5. Secure the tarpaulin metal hold-down strips in place by screwing in all the bolts on the windshield frame.

6. Unfasten and remove the fixing straps of the tarpaulin framework.

7. Remove the spring struts of the tarpaulin framework.

8. Remove the longitudinal struts of the tarpaulin framework.

9. Unscrew the bolts and remove the inclined props of the tarpaulin framework.

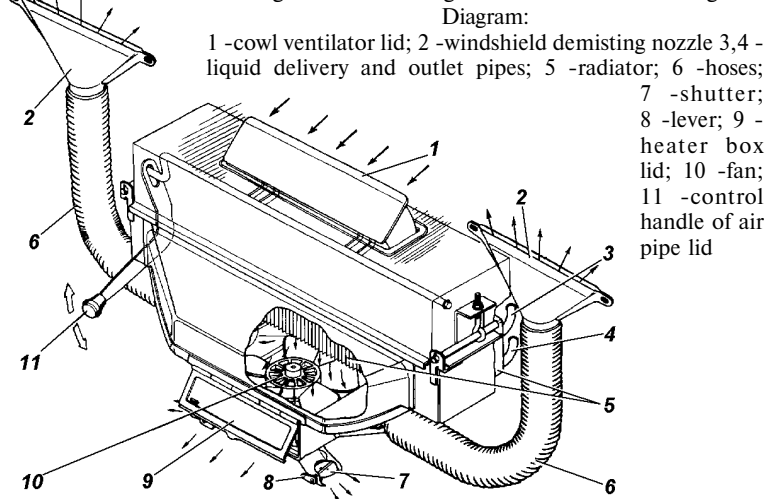
10. Unscrew and remove the tarpaulin bows.

11. Fold up the tarpaulin placing the inclined struts, spring braces and straps inside. Couple the tarpaulin bag by means of the belts.

### Body Heating and Ventilation

The body is heated with air admitted from the outside through the cowl ventilator located in the middle part of the body front. The air passes through heater radiator 5 (Fig. 85) connected into the engine cooling system.

Fig. 85. Cab Heating and Windshield Demisting



The body is ventilated through the cowl ventilator and swivelling quarter-lights provided in the extensions of the doors.

Effective operation of the heater is insured when a temperature of coolant in the engine cooling system is not less than 80 °C.

When draining water from the cooling system, keep the drain cock open otherwise fluid would not drain from the heater radiator.

When the automobile is operated on extremely dusty roads, open the cowl ventilator lid for admitting air into the body which will reduce penetration of dust. At that time the door swivel glasses should be closed.

### Windshield Wiper and Water Pump (Windshield Washer)

**Windshield wiper.** The automobile is equipped with the electric two-speed windshield wiper. It consists of the drive located under the instrument panel and two levers with blades.

For convenience, when washing the windshield, the blade-and-lever assemblies could be swung out of the way.

Do not recommended to wipe the dry glass surfaces. Keep the rubber of brushes out of fuel and oil.

In the service period, check the windshield, rear window and headlamp wipers for proper functioning, check them for reliable attaching, periodically clean the glasses and rubber tapes of blades of dirt and grease.

During the seasonal maintenance, switch on the wipers for 15-20 min, in this case the blade-and-lever assemblies of the windshield should be swung out of the way, and the blade-and-lever assemblies of the rear window should be removed.

After 18-24 months of run and also, if required, replace blades and rubber tapes.

**Washer** (Fig. 86). The electric washer is intended for high-speed cleaning the windshield.

Fill up the washer reservoir with clean water (in summer) or with special antifreezing fluid (in winter).

Adjust the direction of fluid jet (except for headlamp washer jets) by changing the position of the jet balls by means of a needle inserted through the channel of the balls.

When clogging the jet, uncouple the pipe and blow out the jet.

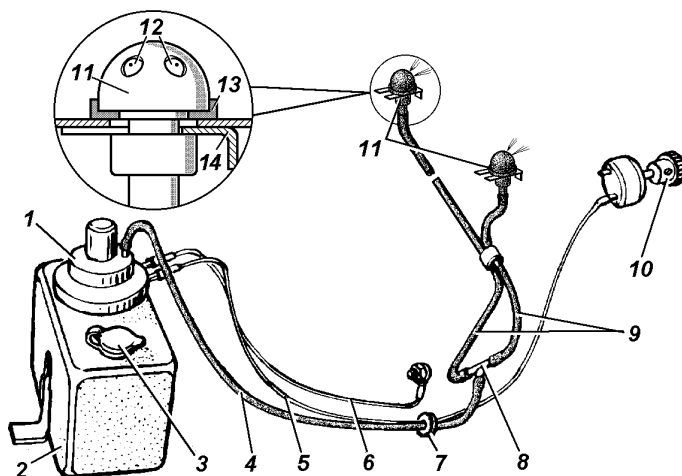


Fig. 86. Windshield Washer:

1 -windshield washer pump housing complete with electric motor; 2 -reservoir; 3 -cap; 4,9 -hoses; 5 -"+" wire ; 6 - ground wire; 7 -seal; 8 -T-pipe; 10 - combination switch; 11 -jet; 12 -jet balls; 13 -gasket; 14 -clamp

Keep watch on the level of fluid in the reservoir not allowing it to drop below a value of 20 mm above the reservoir bottom in order to avoid failure of the washer pumps.

Never keep the washers switched on in excess of 10 s.

### **Maintenance of the Body**

To take care of external appearance of the automobile, maintain regularly the varnish coating of the body. Do not wipe dust and dirt with a dry cloth. Wash the body with water jet of low head using soft rags. Upon washing, wipe the body surfaces dry. Do not use soda or alkaline solutions because the varnish coating could become dull. Do not expose the automobile to sun lights what provokes damage of wheel tyres and sealings.

To take care of the body coatings, use prophylactic polishing liquids: car emulsion, polishing spray, wax AB-70 (for cars) etc. For recovering the lustre of dulled coating, use a cleaning-polishing compound.

During service of the automobile, periodically treat the body surfaces, especially enclosed spaces, with corrosion-preventive compounds. Treat the enclosed spaces of the body through the special holes in the panels and cross-members of the floor which are closed by means of the rubber plugs.

If required, recovery the body floor coated with bituminous cement by spreading it by means of a special spray or brush.

Lubricate assemblies and parts of the body in accordance with Lubrication Table.

## **LUBRICATION OF AUTOMOBILE**

Service life and trouble-free operation of the automobile depend to a great extent on timely and correct lubrication.

The lubricating materials and special fluids are specified in this Instruction Manual. The points on the chassis and engine subject to lubrication are indicated in Lubrication Table.

If there are no special instructions in the column "Description" of Table 3, the indicated oil or grease sorts are used in all seasons.

If several grease marks with the same periodicity of changing are indicated in the column, all the marks are interchangeable.

If the grease mark is provided with the note "substitute", and the other periodicity of changing is indicated, use preferably the base grease mark.

**In the process of lubrication, adhere to the following rules:**

1. Change oil from the engine and transmission when the units are hot.

2. Remove dirt from the grease fittings and plugs.

3. Upon lubrication, remove the squeezed out or leaked lubricant from all parts.

4. Before filling the transmission case, transfer box, the housings of the front and rear axles with fresh oil, wash them, if the waste oil drained from the mentioned units is contaminated or metal particles are detected in it.

5. Mixing the grease "Литол - 24" with the substituting grease "Лита" is allowed in any proportions. When using other substitutes wash the unit with kerosene.

6. Mixing the brake fluids "Роса", "Роса-3", "Томь", "Роса Дот-4" is allowed in any proportions.

If metal particles are detected in oil, open the unit, check it and replace the worn parts.

## **PRESERVATION**

If the automobile is to be removed from operation for a prolonged period of time, it should be subjected to preservation, for which purpose, do the following:

1. Carry out the scheduled maintenance.

2. Wash the automobile and wipe it dry. Touch up the paintwork wherever damaged.

3. To protect the engine cylinders against corrosion pour 30-50 g of engine oil into the cylinders through the spark plug holes. To insure uniform spreading of oil throughout the entire surface of cylinders, crank the engine through 15 revolutions by the starting handle.

4. Clean all wires from dirt and wipe dry.

5. Using the preservative lubricant ПБК (for lack of it - with petrolatum), coat all unpainted external metal surfaces of the automobile and all unpainted parts of hinged joints (hinges and locks of doors, control rods of the carburettor, parking brake, towing gear, and other parts and also ignition coils).

5. Lubricate the springs with a graphite lubricant.
  7. Check, clean the tools, accessories and spare part set and wrap them with oiled paper or with cloth.
  8. Seal the external cab glasses with light-tight paper (cloth) or shut with shields.
  9. Remove the wheels for automobile, clean the wheel disks of dirt and touch up the areas with damaged paint. Clean, wash and wipe dry the tyres, and bring the tyre inflation pressure to normal.
  10. If required, flush out the fuel tanks and fill them with fuel.
  11. Prepare the battery for storage as is specified in the maintenance manual of lead-acid batteries.
  12. Seal the slits of the air cleaner and the muffler exhaust pipe with oiled paper.
  13. Loosen the tension of the fan driving belt.
  14. Drain the coolant from the engine cooling system and the fluid from the windshield washer reservoir.
  15. Seal the transfer box and housings of the front and rear axles for each purpose, wrap the safety valves with the insulating tape.
  16. Clue the clearances between the brake drums and backing plates with oiled paper.
  17. Protect the tyres and other rubber parts from action of direct sunlight.
  18. Put under the axles the metal or wooden props, that the wheels would be raised above the surface.
- Unload the springs; for that put the wooden struts between the frame and axles. The preserved automobile should be located in a clean, ventilated room with relative humidity 40-70% and temperature not less + 5°C.
- Do not keep chemically aggressive substances such as acids, alkalis and other in one location with the automobile.

### **Maintenance of Automobile Placed in Storage**

Once in two months, carry out the following operations:

1. Carefully inspect the automobile from the outside.
2. Unscrew the spark plugs and shift in the first gear of the gearbox and the low range of the transfer box, then turn the crankshaft with the starting lever through 15 of a turn. Once a

year before turning the crankshaft lubricate the engine cylinders with 30-50 drops of engine oil.

3. Clean and paint corroded areas, if any are detected.

4. Rotate the steering wheel from lock-to-lock position for 2-3 times.

5. Check the service and parking brakes, clutch, choke and throttle valves, manual and foot-operated linkages of the throttle valve, headlamp switches for proper functioning.

6. Check the level of working fluid in the reservoirs of the brake master cylinder and the hydraulic clutch master cylinder, and if required, top up to normal.

7. Inspect the ignition distributor, and if required, lubricate its metal parts.

8. Check the tools and accessories if required, wipe and lubricate them.

9. Check the condition of tyres and other rubber parts.

10. Eliminate the troubles detected during inspection.

### **Depreservation**

1. Remove the preservative lubricant from the parts for which purpose, wash them with kerosene or clear gasoline. Remove the lubricant from areas which may come in contact with rubber parts or painted surfaces.

2. Carry out daily maintenance.

3. Check the level of oil in the engine crankcase and drain an excess amount of oil.

4. Before engine starting lubricate each cylinder with 30-50 drops of engine oil and turn the crankshaft with the starting lever through 10-15 of a turn.

### **TRANSPORTATION**

The automobiles are moved depending on the user location: by water, rail or air. The transportation of the automobiles by the course is allowed.

When moving the automobiles in the hold or on the deck of ships, and also by air make them fast in accordance with the ship scheme or air transport scheme. Use appliances, which not damage the parts and paint of the automobile.



Before loading check the driver's kit, accessories and spare parts in accordance with the complete list.

The loading and unloading should be carried out by a crane with special grips in accordance with the scheme in Fig. 87.

On all transports the automobiles should be located so that the distance between the automobiles (extrem points) on the radiator side would be equal to 50-100 mm, and on the other sides - not less than 100 mm.

When moving, the parking brake of the automobile should be on, the engine - shut down, the gearbox lever should be in the position of the first gear, the fluid (water) should be poured out from the cooling system and the signboard "Water is poured out" should be hanged, the storage battery should be cut off with the ground switch.

To protect the automobile from axial and side shiftings attach it with four tension wires of steel wire (dia. 6 mm) with double thread each, and also with wooden wedges 300x160x80 nailed to the floor under wheels. Attach the tension wires to the towing hooks on the frame ahead, and to the towing gear-in rear part of the automobile. After attaching seal the automobile.

Before moving by air, fill the fuel tanks with fuel, but not more than 75% of its capacity.

The automobile should be get into an airplane with the gear box shifted in the first gear and with the transfer box shifted to the low range or by moving backwards (depending on the loading or unloading conditions).

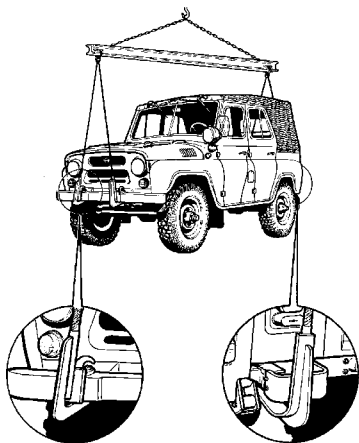


Fig. 87. Scheme of automobile loading (unloading)

## LUBRICATING MATERIALS AND SPECIAL FLUIDS

Description of fluid or grease	SAE equivalents
<b>Motor Oils</b>	
M6 <sub>3</sub> /12Г <sub>1</sub>	SAE 15W-40
M-5 <sub>3</sub> /10Г <sub>1</sub>	SAE 10W-30
M-6 <sub>3</sub> /10B	SAE 10W-40
<b>Transmission Oils</b>	
ТСП-15K	SAE 90
ТСП-10	SAE 75W
<b>Lubricant Grease</b>	
Grease Литол-24	Lithium grease to NLGJ №3
Graphite powder	Barbatia Grease 2
<b>Fluids</b>	
Shock absorber fluid АЖ-12Т, Spindle oil АУ	Shock absorber oil, Shell Donax A
Brake fluid "Томь", "Роса" "Роса-3", "Роса Дот-4"	SAE 1703F, DOT-4
Cooling fluids ОЖ-40 "Лена", ОЖ-65 "Лена", ТОСОЛ-А40М, ТОСОЛ-А65М	Shell safe

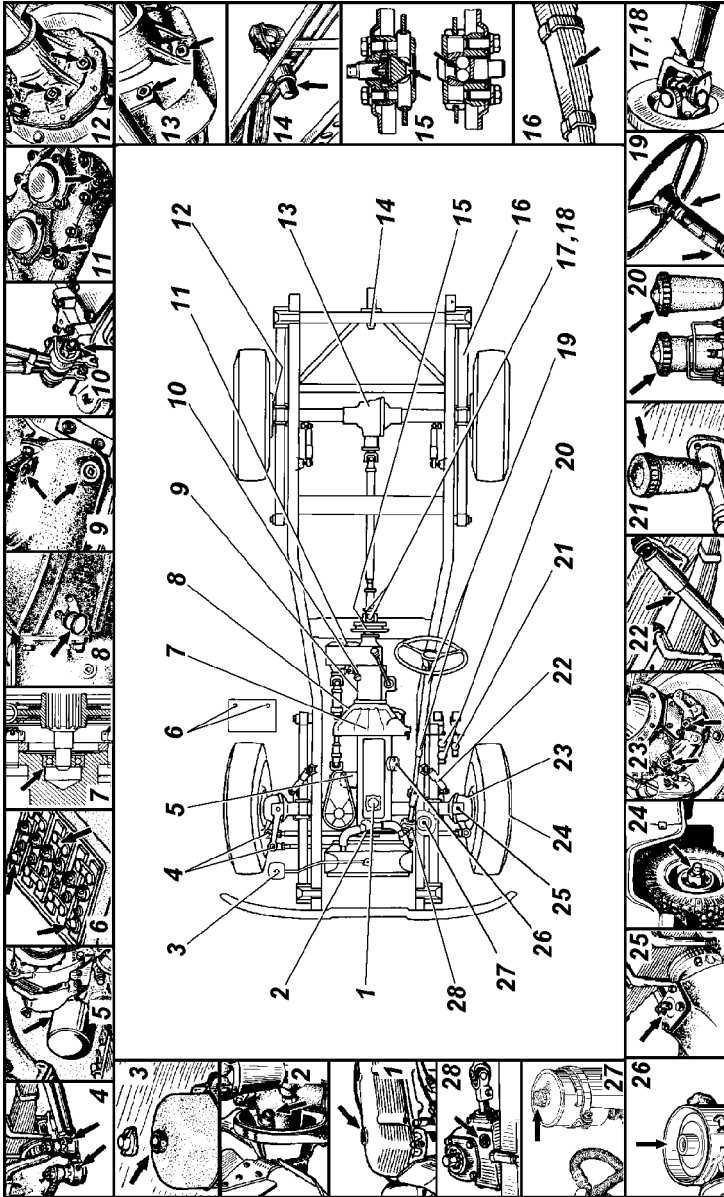


Fig. 88. Lubrication and Tank Chart of Automobile

## LUBRICATION TABLE

Ref. Nos.in Fig.88	Description of units	Number of lubric. points	Lubricant or fluid	Lubrication intervals	Lubrication instructions
1	2	3	4	5	6
1.	Engine crankcase	1	<b>Motor Oils</b> All-purpose M-8B (for MO) M-6з/12Г <sub>1</sub> or Сам Ойл 4111, Сам Ойл 4112, Сам Ойл 4113 M-6з/10B, M-4з/6B <sub>1</sub> , M-5з/10Г <sub>1</sub>	The first - after 1000 km of run, the subsequent - after 16000 km of run or at seasonal maintenance	If required, top up
5.	Engine oil filter	1		Every 8000 km of run	Replace filter after running-in
26.	Distributor rotor bush	1	Motor oil	Every 32000 km of run	Lubricate with 4 or 5 drops (before lubricating, remove runner and filtz)

1	2	3	4	5	6
			<b>Transmission Oils</b>		
9.	Gearbox case	1	ТСп-15К or ТАП - 15В, ТАД-17И,  ТСп-10 - only in cold season (from 1.10 to 1.04)	ТАП-15В - every 32000 km of run, ТСп-15К and ТАД-17И - every 48000 km of run	Add as required
11.	Transfer box case	1			
12.	Hub drive housings	4			
13.	Front and rear axle final drive housings	2			
28.	Steering gear housing	1		When repairing	Add as required
27.	Hydraulic steering booster oil reservoir	1	Specification "P"	Replace once in two years or every 100 000 km of run	Add as required
			<b>Lubricant Grease</b>		
18.	Front and rear propeller shaft splines	2	Grease "Литол-24" Grease "Лита" Grease "Литол-24РК"	Every 8000 km of run	Lubricate through grease fittings (3-5 strokes of gun without forcing grease out)
17.	Front and rear propeller shaft joints	4			Force grease through grease fitting until it shows up from under all lips of cross seals

1	2	3	4	5	6
2.	Cooling system pump bearings	1	Grease "Литол-24" Grease "Лита" Grease "Литол-24РК"	Every 16000 km of run	Add as required
-	Heater motor bearings	to 2			Lubricate with thin layer
4.	Steering rod joints	4		Every 32000 km of run	Lubricate through grease fitting until it shows up from under upper seal washers
8.	Clutch release bearing	1			Pack grease cup to capacity
10.	Transfer box shifting lever shaft	1			Lubricate through grease fitting
14.	Towing gear	1			Lubricate through grease fitting. Lubricate latch and pawl axles as required
15.	Parking brake expander and adjuster mechanism	2			Clean of dirt before lubricating
23.	Steering knuckle joints	2			Wash joints and pack 500 g of grease
25.	Steering knuckle kingpins	2			Lubricate through grease fitting of upper kingpin

1	2	3	4	5	6
24.	Front and rear wheel hub bearings	4	Grease "Литол-24" Grease "Лита" Grease "Литол-24РК"	Every 32000 km of run	Grease layer in bearings should be 10-15 mm thick. Space between rollers should be filled up completely.
7.	Gearbox drive shaft front bearing	1		Add when removing	
6.	Storage battery terminals	2		As required	Protect terminals against acid
-	Door hinges	8			Lubricate through grease fitting
-	Door lock tongues, sockets and latches, hinges of door checks	8			Lubricate
19.	Steering wheel shaft bearings	2		As required, when squeaking bearing and when disassembling	
-	Door and hood locks, latch	7	Grease "Литол-24" Apply grease ЦИАТИМ-201 at temperature below 40 °C	As required	Lubricate

1	2	3	4	5	6
16.	Front and rear springs	4	Graphite grease YCCa	Lubricate as required, when creaking	Lubricate rubber surfaces of spring leaves
-	Rubber weatherstrips and door tongues		Graphite powder	Every 16000 km of run	Wipe
20.	Brake master cylinder	2	<b>Fluids</b>  Brake fluid "Роса", "Роса-3", "Томь", "Роса Дот-4"		Add as required
21.	Clutch release master cylinder	1			
22.	Front and rear shock absorbers	4	Shock absorber fluid АЖ-12Т, spindle oil АУ, oil for hydraulic shock absorbers МГП-10	As required and when disassembling	
3.	Engine cooling system with expansion tank	1	Cooling fluids ОЖ-40 "Лена", ОЖ-65 "Лена" or ТОСОЛ-А40М, ТОСОЛ-А65М	Change once in three years or after 60000 km of run	Wash cooling system before oil changing. Check coolant level. The level should be higher 20-30 mm than mark "min" on expansion tank

**Note.** - The first indicated in column 4 grease is the basic grease.



**LAMPS EMPLOYED ON AUTOMOBILES**

Lamps	Type	Power, W
Head lamps: upper and lower beam	12-45x40 AKГ12-60+55-1(H4)	45x40 60x55
Front lamps:		
clearance light	A12-5	5
turn indicators	A12-21-3	21
Rear lights:		
turn indicators	A12-21-3	21
clearance light	A-12-5	5
stop light	A-12-21-3	21
Turn indicator repeater	A12-5	5
Backing light	A12-21-3	21
License plate lights	A12-10 A12-5*	10 5*
Hood lamp	A12-21-3	21
Cab lamp	A12-4-1	4
Interior dome lamp	A12-10	10
Rear fog lamp	A12-21-3	21
Fog lamps	AKГ12-55 (H1)	55
Hand lamp	A12-21-3	21
Instrument illumination dome lamp	AMH12-3-1	3
Upper beam control light	A12-1.2 A12-1**	1.2 1**
Emergency oil pressure control light	AMH12-3-1 A12-1.2*	3 1.2*
Coolant overheating control light	AMH12-3-1 A12-1.2*	3 1.2*
Turn indicator control light	A12-1.2 A12-1**	1.2 1**
Brake emergency condition warning light	A12-1.2 A12-1**	1.2 1**
Parking brake warning light	A12-1.2 A12-1**	1.2 1**
Warning flasher control light	A12-1.1	1.1

\* On automobile YA3-3153

\*\* On automobile YA3-31512

## TORQUES FOR MAIN THREADED CONNECTIONS, kgf • m

Stud nuts attaching cylinder block heads to cylinder block	9.0-9.4
Connecting rod bolt nuts	6.8-7.5
Crankshaft main bearing cap attachment nuts	12.5-13.6
Bolt nuts attaching flywheel to crankshaft	7.6-8.3
Bolt nuts attaching flanges to propeller shaft	3.2-4.0
Nuts attaching flange to axle pinion	16-22
Bolts attaching final drive gear to differential case	10-14
Spring U-bolt nuts	9.0-10
Wheel attaching nuts	10.5-12
Bolts attaching front axle driving flanges and rear axle axle shafts	6.0-7.0
Nut attaching pitman arm to shaft	20-28
Steering rod ball pin nuts	6.0-8.0
Steering rod lock nuts	10.5-13.0
Ball support attachment bolts	3.6-5.0
Wheel hub bearing lock nuts	5.0-7.0
Anchor plate bolts:	
front	3.6-4.4
rear	4.4-5.6
Wheel reduction gear driving gear bearing removable case attachment bolts	6.5-8
Bolt nuts attaching front spring suspension longitudinal levers and cross rods	14-16

**Note.**

For other threaded connections, the torque should be equal to:

M6 - (0.45-1.0);

M8 - (1.4-1.8);

M10 - (3.0-3.5) kgf • m.

### MAIN METERING JETS OF CARBURETTORS K-151B AND K-151E

Jets	1st chamber	2nd chamber
Main fuel jet	225±3 cm <sup>3</sup> /min (230±3 cm <sup>3</sup> /min)	330±4.5 cm <sup>3</sup> /min
Main air jet	330±4.5 cm <sup>3</sup> /min	230±3 cm <sup>3</sup> /min
Assembly of idling fuel jets:		
idling tube	95±1.5 cm <sup>3</sup> /min (110±1.5 cm <sup>3</sup> /min)	
emulsion tube	85±1.5 cm <sup>3</sup> /min	
Second idling air jet	330±4.5 cm <sup>3</sup> /min (175±2.5 cm <sup>3</sup> /min)	
Idling emulsion jet	280±3.5 cm <sup>3</sup> /min (175±2.5 cm <sup>3</sup> /min)	
Transfer fuel jet		150±2.0 cm <sup>3</sup> /min (200±2.5 cm <sup>3</sup> /min)
Transfer air jet		270±3.5 cm <sup>3</sup> /min

**Notes.**

Some jets of the carburetors K-151B and K-151E differ in rated capacity. A value in brackets is indicated for the carburettor K-151E .

The data-sheet rated capacities indicated in the Table are indented on the corresponding jets.

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## **FOR NOTES**

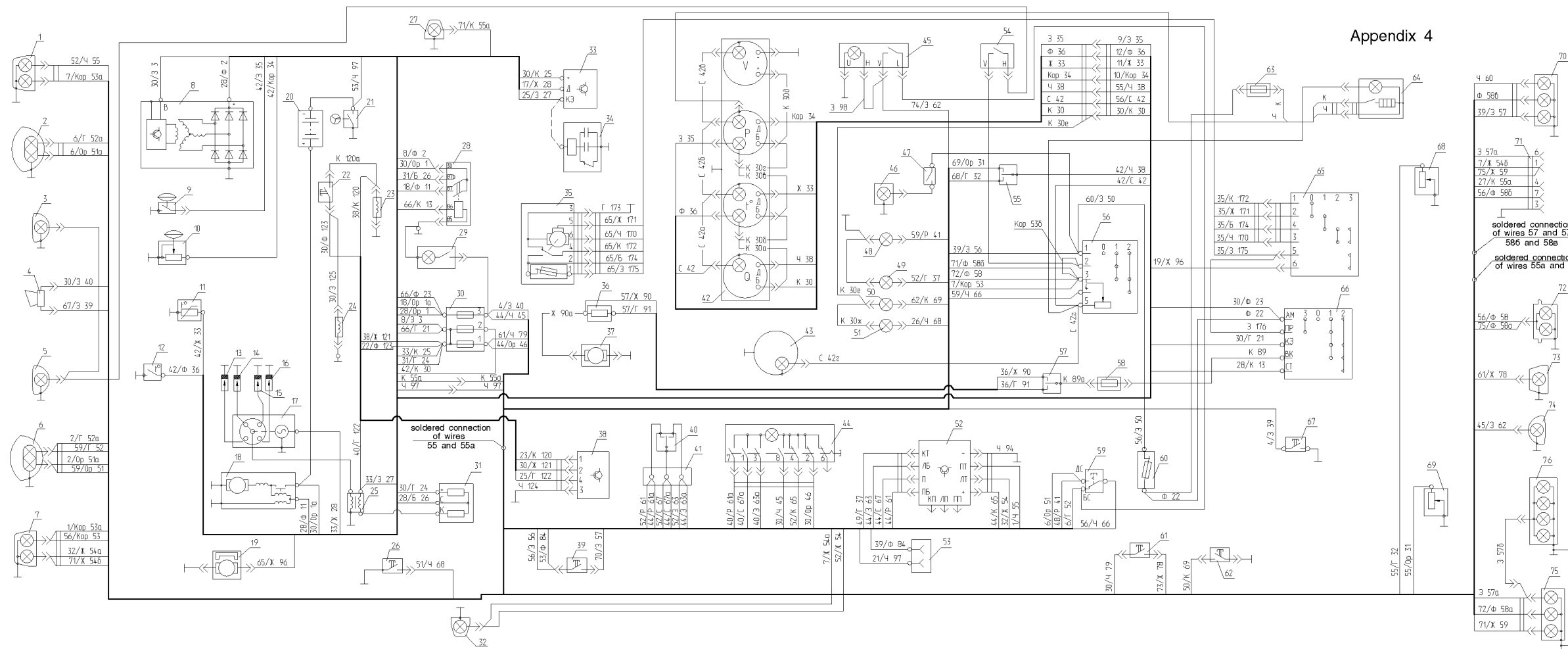


Fig. 1. Wiring Diagram of Automobile YA3-31512:

1 -front lamp; 2 -headlamp; 3 -fog lamp; 4 -horn; 6-fog lamp; 7-headlamp; 8-alternator; 9-oil emergency pressure transmitter; 10-oil pressure transmitter; 11-coolant temperature transmitter; 12-coolant emergency temperature transmitter; 13-16-spark plug; 17-pickup-distributor; 18-starter; 19-electric washer; 20-storage battery; 22-ground switch; 22-microswitch; 23-solenoid valve; 24-carburettor solenoid valve; 25-ignition coil; 26-brake failure warning lamp switch; 27-side repeater flasher; 28-starter relay; 29-hood lamp; 30-fuse unit; 31-series resistor; 32-side repeater flasher; 33-transistor switch; 34-emergency vibrator; 35-windshield wiper; 36-heater resistor; 37-heater motor; 38-carburettor electronic control unit; 39-stop-light switch; 40-turn indicator switch; 41-connection panel; 42-instrument panel; 43-speedometer; 44-emergency signal switch; 45-rear fog lamp switch; 46-interior dome light; 47-dome light switch; 48-high beam control light; 49-turn indicator control light; 50-parking brake control light; 51-brake failure warning light; 52-turn indicators and emergency warning light relay; 53-socket; 54-fog lamp switch; 55-fuel level gauge switch; 56-main light switch; 57-heater switch; 58-heater motor fuse; 59-foot dimmer switch; 60-thermal fuse; 61-backing lamp switch; 62-parking brake warning light switch; 63-cigarette lighter fuse; 64-cigarette lighter; 65-windshield wiper switch; 66-ignition switch; 67-horn button; 68, 69-fuel level transmitter; 70-tail lamp; 71-trailer socket; 72-licence plate lamp; 73-backing lamp; 74-rear fog lamp; 75-additional stop light

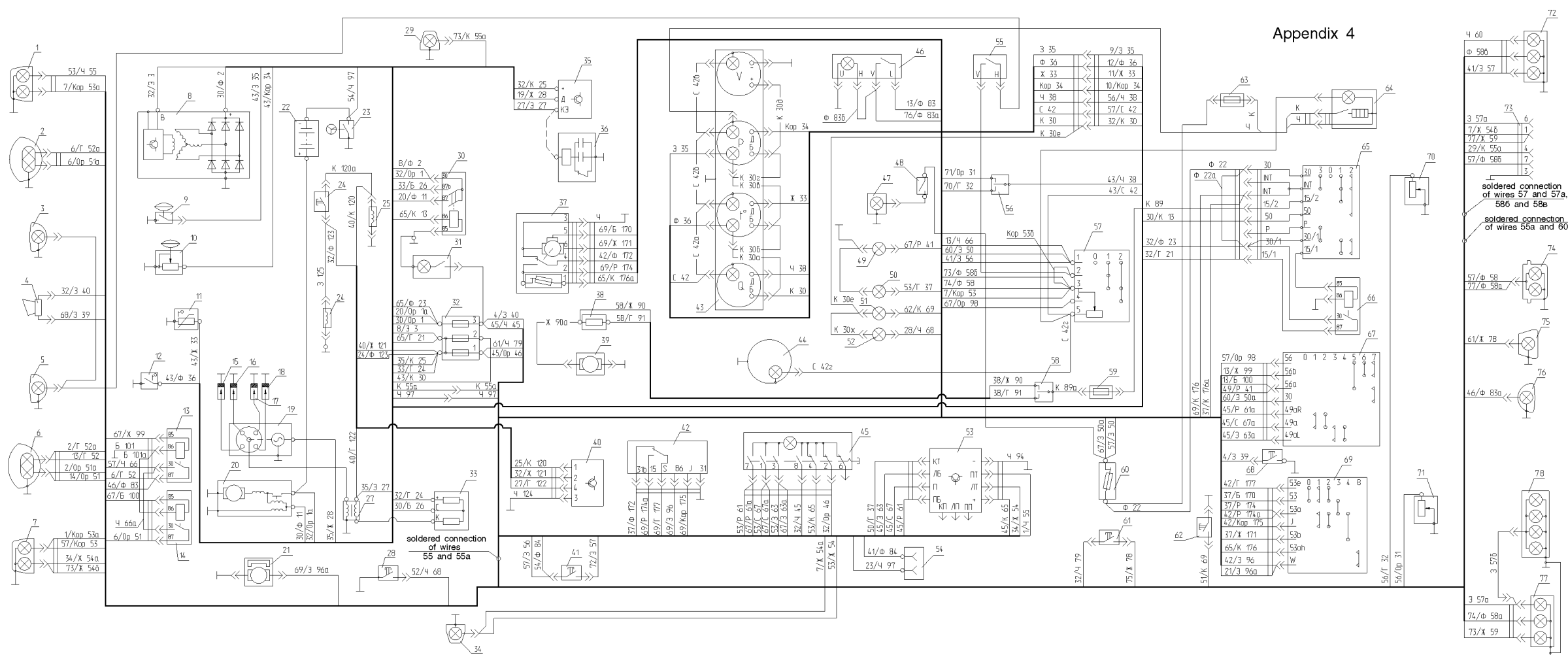


Fig. 2. Wiring Diagram of Automobiles YA3-31514, YA3-31519:

1 -front lamp; 2-headlamp; 3-fog lamp; 4-horn; 6-fog lamp; 7-headlamp; 8-alternator; 9-oil emergency pressure transmitter; 10-oil pressure transmitter; 11- coolant temperature transmitter; 12-coolant emergency temperature transmitter; 13, 14-headlamp switch relay; 15-18-spark plug; 19-pickup-distributor; 20-starter; 21-electric washer; 22-storage battery; 23-ground switch; 24-microswitch; 25-solenoid valve; 26-carburettor solenoid valve; 27-ignition coil; 28-brake failure warning light switch; 29-side repeater flasher; 30-starter relay; 31-hood lamp; 32-fuse unit; 33-series resistor; 34-side repeater flasher; 35-transistor switch; 36-emergency vibrator; 37-windshield wiper; 38-heater resistor; 39-heater motor; 40-carburettor electronic control unit; 41-stop-light switch; 42-windshield wiper breaker; 43-instrument panel; 44-speedometer; 45-emergency warning light switch; 46-rear fog lamp switch; 47-interior dome light; 48-dome light switch; 49-high beam warning light; 50-turn indicator warning light; 51-parking brake warning light; 52-brake failure warning light; 53-turn indicators and emergency warning light relay; 54-socket; 55-fog lamp switch; 56-fuel level gauge switch; 57-main light switch; 58-heater switch; 59-heater motor fuse; 60-thermal fuse; 61-backing lamp switch; 62-parking brake warning light switch; 63-cigarette lighter fuse; 64-cigarette lighter; 65-ignition switch; 66-ignition switch relay; 67-light signal switch; 68-horn button; 69-windshield wiper switch; 70, 71-fuel level transmitter; 72-tail lamp; 73-trailer socket; 74-licence plate lamp; 75-backing lamp; 76-rear fog lamp; 77-tail lamp; 78-additional stop light

#### Wire Colour Code:

Б - white; Г - blue; Ж - yellow; 3 - green; К - red; Коп - brown; Оп - orange; С - grey; Ф - violet; Ч - black

Wire designation denotes: the first one or two numerals (before a slant line) denote the instrument number in the diagram to which this wire is connected; one or several letters (after a slant line) denote the wire colour; the last one or four signs denote the wire conventional number in the diagram



## Appendix 4

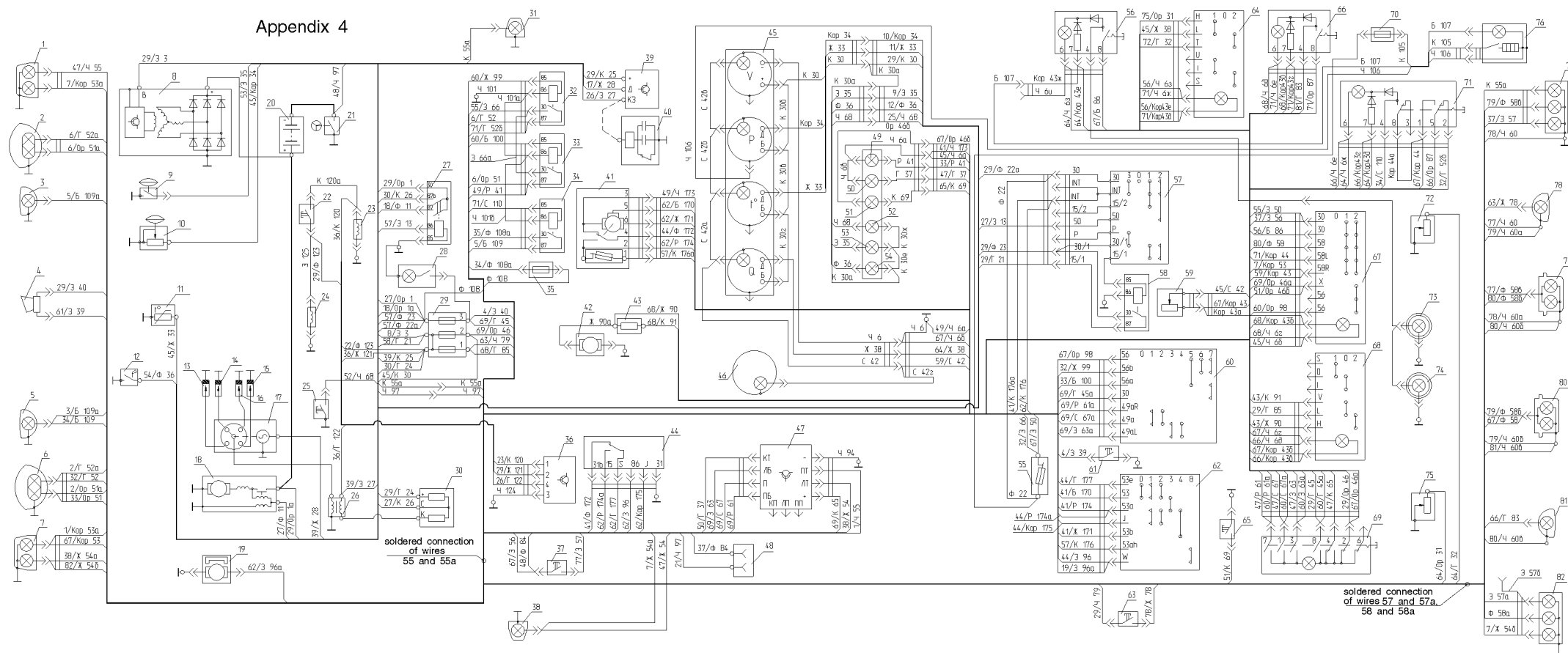


Fig. 3. Wiring Diagram of Automobile YA3-3153:

1-front lamp; 2-headlamp; 3-fog lamp; 4-horn; 6-fog lamp; 7-headlamp; 8-alternator; 9-oil emergency pressure transmitter; 10-oil pressure transmitter; 11-coolant temperature transmitter; 12-coolant emergency temperature transmitter; 13-16-spark plug; 17-pickup-distributor; 18-starter; 19-electric washer; 20-storage battery; 21-ground switch; 22-microswitch; 23-solenoid valve; 24-carburettor solenoid valve; 25-brake failure warning light switch; 26-ignition coil; 27-starter relay; 28-hood lamp; 29-fuse unit; 30-series resistor; 31-side repeater flasher; 32, 33-headlamp switch relay; 34-fog lamp relay; 35-fog lamp fuse; 36-carburettor electronic control unit; 37-stop-light switch; 38-turn indicator repeater; 39-transistor commutator; 40-emergency vibrator; 41-windshield wiper; 42-heater motor; 43-heater resistor; 44-windshield wiper breaker; 45-instrument panel; 46-speedometer; 47-turn indicators and emergency warning light relay; 48-socket; 49-high beam warning light; 50-turn indicator warning light; 51-parking brake warning light; 52-brake failure warning light; 53-oil emergency pressure warning light; 54-coolant overheating temperature warning light; 55-thermal fuse; 56-interior dome light switch; 57-ignition switch; 58-ignition switch relay; 59-instrument lighting rheostat; 60-light signal switch; 61-horn button; 62-windshield wiper switch; 63-backing lamp switch; 64-fuel level gauge switch; 65-parking brake warning light switch; 66-rear fog lamp switch; 67-outer lighting switch; 68-heater switch; 69-emergency warning light switch; 70-cigarette lighter fuse; 71-fog lamp switch; 72-fuel level transmitter; 73, 74-interior dome light; 75-fuel level transmitter; 76-cigarette lighter; 77-tail lamp; 78-backing lamp; 79, 80-licence plate lamp; 81-rear fog lamp; 82-tail lamp

Wire Colour Code:

Б - white; Г - blue; Ж - yellow; З - green; К - red; Коп - brown; Оп - orange; С - grey; Ф - violet; Ч - black

Wire designation denotes: the first one or two numerals (before a slant line) denote the instrument number in the diagram to which this wire is connected; one or several letters (after a slant line) denote the wire colour; the last one or four signs denote the wire conventional number in the diagram