

URAL-4320-60/61, URAL-43206-61, URAL-5557-60 TRUCKS AND THEIR MODIFICATIONS



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URAL-4320-60/61, URAL-43206-61, URAL-5557-60 TRUCKS AND THEIR MODIFICATIONS

Operation Manual
4320-3902037 PΘ
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Miass – 2014

The Operation Manual is to be used by drivers and motor service staff involved in Ural trucks operation. This Operation Manual includes the trucks technical specification, a brief description of the truck units and subunits, their adjustment and maintenance, and reference data.

Due to constant product improvement enhancing its reliability and operating conditions, certain changes not included in this Manual may be made to the design.

When operating the trucks, use the present Operation Manual, Yaroslavl Motor Works YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units Operation Manual, and Addendum YAMZ-6565, YAMZ-65651, YAMZ-65652, YAMZ-65653, YAMZ-65654 Engines and their configurations to the Operation Manual for YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units, Air Heater Specification and installation instruction, Storage Batteries Operation Manual, Starting preheater Operation Manual, Gearbox Operation Manual, Tow unit 21-202 Installation and Operation Manual, Tachograph Operation Manual.

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1. FOREWORD

1.1. Ural all-terrain trucks (4x4, 6x6), with YAMZ-65654 diesel engine, with a three-seat, all-metal cab located behind the engine are intended for transporting cargoes, people and towing trailers on all kinds of roads and terrain.

Ural-4320-0111-61 truck shown in Fig. 1 is intended for transporting various cargoes, people and towing trailers on all kinds of roads and terrain.

Ural-4320-1151-61 chassis is intended for packaging specialties.

Ural-43203-1151-61 chassis is intended for mounting box van body.

Ural-4320-0911-60 truck with an enhanced base is intended for transportation of various cargoes and people and for towing trailers on all kinds of roads and particular terrain.

Ural-4320-1951-60 special chassis with an enhanced base is intended for mounting technological equipment and specialties (oilfield, crane, drilling, tankers, fire fighting, municipal etc), towing trailers on all kinds of roads and particular terrain.

Ural-5557-1151-60, Ural-55571-1151-60 chassis shown in Fig. 2 are intended for mounting various bodies and equipment.

Ural-43206-0111-61 truck shown in Fig. 3 is intended for transporting various cargoes, people and towing trailers on all kinds of roads and terrain.

Ural-43206-1151-61 multipurpose chassis without a spare wheel holder is intended for packaging specialties.

Ural-44202-0311-60 bolster truck is intended for towing semi-trailers on all kinds of roads.

Ural-44202-0511-60 bolster truck with a two-door cabin with a berth is intended for towing semi-trailers on all kinds of roads.



Fig. 1 – Ural-4320-61 Truck



Fig. 2 – Ural-55571-60 Chassis



Fig. 3 – Ural-43206-61 Truck

The trucks are designed for operation at ambient temperatures ranging from +50 °C down to –45 °C (a short-time operation at –50 °C).

The trucks meet the requirements of Specifications 37.165.404-2012 "Ural" 4x4, 6x6 Trucks".

In case of using the trucks for other purposes, or with violations of operating instructions, as well as introducing any design changes without the consent of the "URAL" Automobile Works OE JSC, the manufacturer will not accept reclamations from customers or consider any claims.

The first overhaul period for the first category of the operational conditions in accordance with the "Regulations on the maintenance and repair of rolling stock of automobile transport", subject to all the rules specified in the Operation manual, for the trucks should be not less than: for Ural-43206-61, Ural-5557-60, Ural-55571-60 vehicles and their modifications — 200 000 km, for Ural-4320-60/61 vehicles and their modifications — 250 000 km.

During this period, the replacement of components and assemblies that have covered their predetermined haulage is permissible, which is also valid for purchased items which resource specified in the manufacturer plants technical documents and standards, is shorter than the vehicle resource.

The trucks and chassis are available in various packaging for design variants and nomenclature of the components.

On the basis of the trucks and chassis various products (tank trucks, crane trucks, oil field equipment, vans, etc.) are manufactured as well. All comments and proposals regarding their work should be referred to manufacturers of those products).

It is allowed to use the trucks with pull-type systems which have air outlets and electric outlets as per GOST 9200-76 (version II), the brake system air outlet as per GOST 4364-81 Standard, brake systems as per GOST 22895-77 Standard, a gross weight corresponding to the specifications, and drawbars: for trailers – a coupling pin having "A" diameter as per GOST 12017-81 Standard that is equal to 50.8 mm and mounting dimensions as per GOST 12105-74 Standard for rated load on the fifth wheel over 83.3 kN (8.5 tf) 2349 Standard or a coupling pivot as per GOST R 41.55 Standard for semi-trailers having "A" diameter as per GOST; for trailers* — a trailer hitch (drawbar eyelet) must comply with class D50 as per GOST R 41.55-2005 (for non-clearance tow unit), basic dimensions must comply with GOST R 41.55-2005 Standard and ISO 1102-75.

Application of eyelets of other dimension is not allowed.

Mounting of various equipment and mechanisms onto the truck and its chassis is allowed only after agreeing it upon with **the Engineering Department of the "URAL" Automobile Works**. Otherwise, a customer shall be deprived to make any claims relating to premature failure of truck components.

1.2. Marking of Ural trucks and chassis comprises the truck marking as a whole transport means, marking of the chassis and cab and engine as constituent parts of the transport means. The structure of the marking corresponds to a "Wheeled vehicles safety technical regulation».

* Upon the Customer request it is technically feasible to install a towing coupler of «hook-loop» type (delivered as spare parts to Ural vehicles) for using with trailers as per GOST 2349-75 dimension-type 3. The towbar (coupling hook lug) should correspond to GOST 2349-75.

The VIN identification number (or that of the chassis) is marked by impact method on the back of the truck right side member:

- for 4x4 trucks (chassis) at the distance of 200-300 mm back from the rear axle and 40-60 mm down from the sidemember upper flange;
- for 6x6 trucks (chassis) at the distance of 1000-1250 mm back from the bogie axis and 40-60 mm down from the sidemember upper flange.

The nameplate is attached to the r. h. panel of the cab side near the footstep. The nameplate contains:

- manufacture trademark;
- identification number;
- modification;
- technically permissible maximum weight;
- technically permissible maximum axle loads;
- technically permissible gross combination weight;
- maximum load on fifth wheel arrangement load;
- Vehicle (chassis) Type Approval number.

To the left of the nameplate, the cab number is marked on the right panel of the cab in-step plate. The marking contains 14 digits and is applied by hammering

Structure of the vehicle identification number and its explanation:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
X	1	P	*	*	*	*	*	*	*	*	*	*	*	*	*	*
* - Variable data																

- Item 1-3 — X1P – “URAL” Automobile Works” JSC, Miass, Chelyabinsk Region, Russia (manufacturer’s international identification code)
- Item 4-9 — Product designation
- Item 10 — Year of manufacture
- Item 11-17 — Serial production number of vehicle

Letters used for indicating the year of manufacture:

- | | |
|----------|----------|
| D - 2013 | F-2015 |
| E - 2014 | G - 2016 |

Data on engine marking are given in «YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units» Operation Manual, «YAMZ-6565, YAMZ-65651, YAMZ-65652, YAMZ-65653, YAMZ-65654 Engines and their configurations» Addendum to the Operation Manual «YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units».

2 Safety requirements and precautions

2.1 Safety requirements

2.1.1 Before you start working, make sure that the truck and its coupling devices are in good working order.

2.1.2 **While driving the vehicle, the driver and passengers must wear seat belts.**

2.1.3 Do not start the truck engine, without making sure that the gearbox is in neutral.

2.1.4 Service and repair the truck on a level ground, after having braked the parking brake by disconnecting the batteries using the switch and placing wheel chocks under the wheels.

2.1.5 Keep the engine and starting preheater clean and maintain their working order, make sure there are no fuel and oil leakages: this may cause fire. During the preheater operation, do not leave the vehicle unattended.

2.1.6 In the process of filling the truck with fuel, the pre-heater must be switched off.

2.1.7 Do not warm up the engine, if the truck is indoors, and ventilation is poor.

2.1.8 Coolants (low-freezing) and brake fluids are toxical: handle with care.

2.1.9 To climb the truck front bumper and descend it, use the step plate, central and left-most (in direction of travel) grille ribs having on the inserts on the inner side, as shown in Figure 4.

2.1.10 When servicing the engine, fix the hood lifting mechanism with a safety hook 1 (Fig.5).

2.1.11 Before dismantling the wheel put the wheel chocks under the unlifted axle wheels in order to avoid the vehicle self-motion. Unfasten the wheel nuts, hang out the wheel with jack or other hoisting device, unscrew the nuts and dismantle the wheel.

To lift the front axle with the jack, insert its screw head in the spring clamp socket; to lift the rear axle – under the spring supporting bracket.

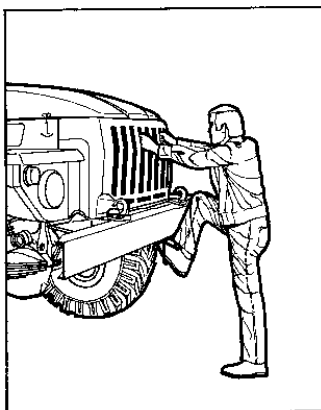
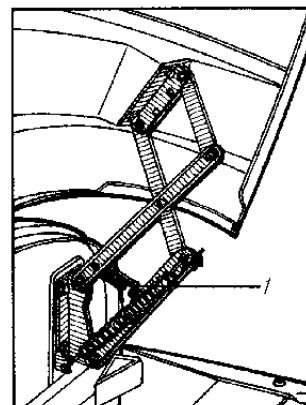


Fig. 4 - How to Use Step and Radiator Grill Ribs, When Climbing Bumper and Coming Down It



1- safety hook

Fig. 5 - Hood Lifting Mechanism Safety Lock

2.1.12 It is prohibited to remove any wheel from the truck, if all air has not been let out of its tyre before.

2.1.13 It is prohibited to mount a just assembled and uninflated wheel with its tire onto the truck and inflate the tire using the tire inflation system.

2.1.14 **The manufacturer draws your special attention to strict compliance with safety regulations changing / mounting the wheel (see «Wheels and Tires» Section).**

2.1.15 While lowering the spare wheel, keep yourself out of reach of the wheel holder hinged bracket.

2.1.16 Before the truck full stop, it is prohibited to remove the ignition key out of the ignition lock, because this leads to loss of control of the truck due to a steering shaft lock by an anti-theft device.

2.1.17 It is prohibited to use the truck without lock spring ring 14 (See Fig.118) and winged nut 5 of the storage battery compartment cover.

2.1.18 To avoid falling down the storage batteries in the course of their servicing on the truck move the battery out of the container only on the container hinged cover, make sure it is fixed securely in its horizontal position.

2.1.19 In case of electrolytic solution contact with skin, within 5-10 min it is necessary to rinse the affected area with abundant jets of water and moisten with 10% liquid ammonia aqueous solution and then with a weak solution of soda.

2.1.20 Check condition of the insulation of the wire from “+” battery terminal to the starter: damaged insulation can cause fire.

2.1.21 Perform welding on the truck, observing fire safety measures. When carrying out electric welding disconnect wires from the generator, batteries and electronic control units, to protect the plastic pipes and fuel lines from damage. Connect the welder ground conductor close to the weld spot, having prevented the electric current passing through bearings and friction pairs.

2.1.22 When moving upgrade, it is necessary to select the required gear in advance.

2.1.23 When transporting passengers, fix the right door lock of the cab 4 as shown in Figure 116.

2.1.24 Hitch and unhitch the trailer (semi-trailer) on an even flat site.

2.1.25 When using the winch:

- do not stay under the cargo to be transferred as well as close to the tensioned rope;
- avoid kinks or knots on the rope as they can result in its damage and break. When extending the rope across the road, put a guard and warning signs prohibiting to pass.

2.1.26 When using the independent air heater keep in mind that the heater mishandling, as well as heater failures, are the sources of extreme fire danger and may cause exhaust fumes poisoning.

Prohibited:

- leaving the working heater unattended;
- using the heater with faulty wiring (electric junction sparking);
- using the heater when the inlet and exhaust branches are partially or completely overlapped;
- opening the case top cap when the heater is working and touch the hot components;

- placing explosive and inflammable substances or devices (e.g. spray bottles, etc.) in the heater heat flow area;
- using the heater in an unaired area;
- using the heater with the damaged fuel supply system;
- starting and using the heater poured over with fuel;
- switch on heating when transporting flammable cargoes at temperatures above minus 5°C in order to avoid fire;
- switching on and using the heater near gas-filling stations and other places with inflammable vapors or significant amounts of explosive dust (carbon, wood dust, etc.) in the air.

Keep the independent air heater switched off at gas-filling stations and during fuel tanking.

In case of the fuel ignition, switch off the independent air heater immediately and use the fire extinguisher if necessary.

Attention! Do not extinguish burning fuel with water.

2.1.27 If burnout loss signs or fuel and combustion products smell is detected in the cab, switch off the heater. Further operation of the heater is possible after removing the causes occasioned the exhaust gases penetration in the cab.

2.2. Precautions

Proper operation of the truck and its long service life can be ensured if you observe all recommendations given in this Manual.

2.2.1 Before operating the truck, you should carefully read the section "PRECAUTIONS", "SAFETY REQUIREMENTS".

2.2.2 When running the first 1000 km (50 hours of engine operation), comply with the rules described in Section "New Truck Running-in".

2.2.3 Before starting the engine, you must carefully read the section "Power unit start, operation and stop" of the power units operating manual.

2.2.4 To prevent air penetration in the fuel feed system do not burn all the fuel from the fuel tank.

2.2.5 See that the preheater fuel pump is adjusted correctly, not allowing open flame in the gas conduit of the heat exchanger.

2.2.6 Do not allow the preheater to operate for more than 15 sec without a coolant in the heat exchanger. Upon washing the truck or its fording, engage the pump unit for 2-3 min to remove water from the preheater air duct.

2.2.7 Warm up the engine till switching on all the cylinders and changing the engine speed when changing the fuel supply; start travelling at low gear.

It is recommended after the engine start for its uniform heating and increasing the temperature in the cab, start traveling at low gear after the coolant has been heated up to 40 °C.

The optimum temperature of the working engine coolant should be 75-100 °C.

2.2.8 To drain the fluid from the engine cooling system completely, place the truck on a flat site or incline it forward.

2.2.9 Drain the coolant from the engine cooling system through three cocks (on the heat exchanger, on the pump unit and on the water pump inlet branch) with the open cab heater cock and the open plugs of the radiator and preheater filling pipe. If water is used in the engine cooling system in an emergency situation, remove the rest of water from the preheater liquid pump by engaging the pump unit for 10-15 sec to avoid the fan impeller freezing-on. Upon draining the fluid, close the cocks.

2.2.10 Transfer gearbox and rear axles differential lock switches should be in «off» position when the differentials are unlocked.

2.2.11 Shifting gears in the transfer case is only allowed after the vehicle full stop.

2.2.12 Cross-axle differential locking is to be used in certain conditions only as per «Truck Driving» Section.

2.2.13 Lock and unlock differentials after the vehicle has been completely stopped. If the differentials failed to lock, it is necessary to pull away smoothly and drive the vehicle at a speed not exceeding 5 km / h till the differentials lock, performing the interaxle differential locking.

2.2.14 With a cross-axle differential locked, drive the vehicle at speed not exceeding 20 km/h on the straight only.

1.2.15 When driving out of a rut, do not go for a long time with the steering wheel turned in the extreme position since oil can be overheated in the hydraulic system and the pump may be broken.

For the same reason, when taking off power in steady-state condition, release the steering control shaft by turning the steering wheel until it turns freely.

It is recommended to set the steering gear sliding valve to the neutral position in the following order:

- when the engine is running turn the front wheels to the extreme left or to the extreme right position and release the steering wheel;
- stop engine;
- after wheels partial self-return, set the steering wheel to the middle position within free motion at that wheels position.

Having performed these actions the engine can be started and the vehicle can be operated in steady-state conditions.

2.2.16 Before the truck starts travelling, the air pressure in the brake system should be not less than 440 kPa (4,7 kgf/cm²). If alarm lamp 3 (see Fig.20) on the dashboard turns on, remedy a fault occurred in the pneumatic part of the drive.

2.2.17 Before travelling, check if the alarms of the pilot lamp assemblies (see Fig. 20) are in good working order 9.

2.2.18 Do not use the truck with the lowered tailgate, because in this position it closes the rear signalling lights.

2.2.19 If the engine has not been started or has stalled by any reasons, first set the key into its initial upright position, than switch on the starter in 1–2 min.

2.2.20 Frequent starting of the engine with its short-term operation result in quick discharge of the storage battery.

2.2.21 Do not move the truck using the starter: this may cause starter breakdown and quick storage batteries discharge.

2.2.22 To avoid generator breakdown attach the starter cable to the positive terminal of the storage battery and attach the storage battery switch cable to the negative terminal..

2.2.23 Attach cables to the generator set according to the marking.

2.2.24 Prior to removing the generator from the engine switch off the storage battery.

2.2.25 During long-term parking of the truck disconnect the storage battery from the “ground” with the help of the “ground” switch button 37 (see Fig. 18).

2.2.26 When starting the engine from an external source, it is required to switch on the storage battery. It is prohibited to use a direct-current source with ratings exceeding 24 V at a current of 0 (zero) A and 18.3 V at a current of 1000 A and the storage battery that has a rated capacity different from 190 A.h by more than ± 20 A.h.

2.2.27 Removal of the seals from the speedometer and speedometer sender in the warranty period without the permission of the manufacturer drive flexible shaft deprives a customer to make any claims.

2.2.28 At an ambient temperature lower than -25°C use an auxiliary power take-off only after a short run (approximately 15 km) or warming-up of the oil in the transfer box by other method, for example, by hot air.

2.2.29 During the truck travelling the wheel valves of the tire pressure control system should be opened. When the truck has been parked for a long time, close the wheel valves. At an ambient temperature lower than -35°C open the wheel valves 15–20 km after beginning of travel. Upon opening the wheel valves blow through the tire pressure control system with the air from the tires (see the Section “Central Tire Pressure Control System”).

2.2.30 When towing, in order to avoid the gearbox failure, engage the neutral gear in the transfer gearbox. Towing is performed limiting the maximum towing speed to 50 km/h.

2.2.31 Manoeuvring, particularly while reversing, do not allow big angles of the road train folding to avoid damage of the drawbar.

2.2.32 When using a trailer at an ambient temperature less than -25°C , do not leave the rubber buffer of the drawbar under load before a long parking to avoid freezing of the pressed rubber bumper and appearing an axial clearance in the drawbar. Disconnect the trailer or unload the axial load from the rubber buffer by moving the truck forwards and backwards.

2.2.33 When a loader having a total weight exceeding 3200 kg is running onto the truck platform, put shields (boards) under its wheels.

2.2.34 Put heavy small-sized cargoes, which can cause local sagging of the platform floor or damage the body sides and seat components, onto sills (boards) and fix them securely. Place the cargo so that its centre of inertia is located in the middle of the truck platform.

2.2.35 If after parking the truck for a long time or for the reason of high air leaks, the complete air leakage occurred and the gear is engaged, it is necessary to disengage the gear (setting in the neutral position) by alternate turning the engine crankshaft to the right and left through approximately 180° , using the technique described in the Section “Adjustment of Valve Timing Mechanism” of the engine Operation manual or release the clutch by filling the pneumatic system by the compressed air with the help of another truck via the towing valve.

2.2.36 Transportation of goods or towing trailers (or transport means) exceeding the max weights indicated in the Operation Manual is not admissible.

2.2.37 After a long-term travelling in snowfall conditions or on snow-covered roads — remove the air filter cover and shake out the snow from the filter compartment.

2.2.38 When operating the truck with a trailer it is not admissible to:

- use a towing coupler on GOST P 41.55-2005, if the control pin projects relative to the handle (see the Installation and Operation Instructions «Towing coupler 21-202», Section «Operation and description», subsection «Coupling control»).

- use a towing coupler on GOST 2349-75 with unsecured latch of the towing hook by the locking pin (see «Running Gear» Section).

2.2.39 Using tires of different manufacturing plants on the same truck is not admissible.

3 Specifications

3.1 Basic parameters and dimensions

3.1.1 Basic parameters are given in Table 1 and 2.

Table 1 - 6x6 Trucks basic parameters

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
General data									
Payload, kg	6000	-	-	10 000	-	-	-	-	-
Payload on chassis, kg	-	6875	6845	-	12 000	12 000/9000*	12 000	-	-
Truck (chassis) bare weight, kg	8940	8000/8500* ¹	8285	-	8520	8335	8410	8640	8765
Total vehicle weight with cargo, driver and passengers (225 kg) disregarding the curb weight tolerance, kg	15 165	15 100/17 300* ²	15 355/17 300* ²	21 300* ²	20 745/21 300* ²	20 560/21 300* ²	20 635/21 300* ²	19 865/14 215*	19 990/14 340*
Gross trailer (semitrailer) weight, kg	11 500/7000*			11 500/7000*			11 500		
Weight distribution of empty truck (chassis) with additional equipment and outfit, kg: on the front axle on rear bogie	4710 4230	4540 3460	4685 3600	4900 4740	4860 3660	4350 3985	4695 3715	4765 3875	4830 3935

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Gross vehicle weight distribution, kg: on the front axle	4910	5060/ 5300* ²	4970/ 5300* ²	5300* ²	5260/ 5300* ²	5090/ 5300* ²	5275/ 5300* ²	5725/ 4265*	5190/ 4300*
on rear bogie	10 255	10 040/ 12 000* ²	10 390/ 12 000* ²	16 000* ²	15 490/ 16 000* ²	15 885/ 16 000* ²	15 360/ 16 000* ²	14 740/ 9950*	14800/ 10 040*
Operational data									
Maximum travelling speed at gross weight, km/h	80								
Truck (chassis, bolster truck (road train)) estimated fuel consumption*3 at speed of 60 km/h per 100 km, l, max	36	40	37	36	47				
Cruising range on truck (chassis) control fuel consumption at a speed of 60 km/h, km	572 (fuel tank 210 l) 816 (fuel tank 300 l)	515 (fuel tank 210 l) 785 (fuel tank 300 l)		730					
Braking distance with GVW when travelling at a speed of 60 km/h, m, max	36,7								
Maximum ascent at GVW, degrees, (%), no less than	60 (31)	27 (15)		18 (11)					
The least turning radius on the front outer wheel track axis (relative to the turning center), m, max	11,5	13,0	11,5	-					

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Fordability (hard – bottom ford) at natural wave (not produced by the truck), m	0,7								
Engine									
Model, type	YAMZ-65654, ignition by compression, four – stroke, turbocharged, 6 – cylinder V – engine								
Operating capacity, l	11,15								
Rated capacity, kW (hp), no less than	169(230)								
Maximum torque, gross, N.m (kgf.m), no less than	882(90)								
Nominal speed, min ⁻¹	2100 ⁺⁵⁰ ₋₂₀								
Rpm corresponding to themax torque, min ⁻¹	1100-1500								
Engine lubricating system	Mixed, under pressure with injection and with the oil cooling in the liquid – to – oil heat ex – changer								
Engine feed system Main fuel tank, l	210 (refill capacity 206) or 300 (refill capacity 294)								
Engine air feed system	with dry air filter with the replaceable cardboard filtering element, air – cooling and with a contamination indicator								
Exhaust system	with the release from the turbo – charger backwards, pipeline with wearproof (auxiliary) brake, noise suppressor, the end of the exhaust pipe is directed to the truck axis								

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Cooling system	hydronic, closed – type with forced – circulation of liquid coolants. Corrugated – vane radiator								
Transmission									
Clutch	YAMZ-183-15, friction clutch, dry, single-disk with a pull-out diaphragm spring, asbestos-free clutch linings, hydraulically operated, pneumo-hydraulic booster								
Gearbox	YAMZ-2361, mechanical, three-throw, five-gear, with speed synchronizers for the second, third, fourth and fifth gear								
gear ratios	first gear-5,22; second gear-2,90; third gear-1,52; fourth gear-1,00 fifth gear-0,664 or 0,71; reverse-5,22								
Transfer gearbox	Mechanical, two-step blocked interaxle differential distributing the torque between the front and the rear axle with the 1:2 ratio, with the front axle drive								
gear ratios	high gear — 1,21 or 1,04 low gear — 2,15								
Cardan drive	Exposed, with four shafts, joints on the needle bearings								
Axles	Driving, combined axle case consists of a cast middle part and half-axle casings pressed in it. The front axle is a steerable one, with constant velocity joints of disk-type								
Main gear	Double, drive-through type, two conical spiral tooth gears and two cylindrical skew gears. Main gears of all axles are interchangeable								
gear ratio	Differential is symmetrical, conical with four pinions. Semi axles are fully offloaded, spline joint with the hub 7,49								
Running gear									
Frame	Stamped, riveted								
Towing devices	In the front: rigid towing hooks, in the rear: double-action towing unit								
Truck suspension: front	Conventional suspension on two semi-elliptic springs, operating jointly with two bilateral hydraulic snubbers								
rear	Conventional balancing suspension with torque rods, on two longitudinal semi-elliptic springs								

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Wheels	515-254 (254Г-508) disk split wheels with divided semi-deep rim, having toroidal bead seats, centered at the chamfers of the clamping holes, wheel offset 120 mm							
Tires	14.00-20, 146G (HC14/PR14) model ОИ-25 pneumatic, tubed, conventional profile, with heavy-duty tread pattern, adjustable tire pressure, max admissible load 30,40 kN (3100 kgf)			According to the truck package: a) 425/85R21 156G, (HC16/PR16) KAMA-1260 (with heavy-duty tread pattern) or model KAMA-1260-1 (with versatile tread pattern), pneumatic, radial, tubed, wide-section, with, controllable tire pressure, max admissible load 39,46 kN (4000 kgf) or б) 425/85R21 , 156J (HC18/PR18) m O-184 pneumatic, tubed, conventional profile, with heavy-duty tread pattern, with controllable tire pressure, max admissible load 39,46 kN (4000 kgf) or в) 425/85R21 156G, (HC16/PR16) Бел-1260, pneumatic, radial, tubed, with heavy-duty tread pattern, with controllable tire pressure, max admissible load 39,46 kN (4000 kgf)				
Spare wheel holder location	Vertical, behind the cab*5 or secured by means of the technological service support				-			
Steering								
Type of transmission	Mechanical, with hydraulic booster							
Steering gear (type, marking)	MAZ – 64229 or RBL C-700 (Germany), «screw – ball nut-rack-sector» with hydraulic booster (for RBL C-700), steering drive with hydraulic booster (for MAZ – 64229)							
Booster unit	Hydraulic, double-action type							
Booster unit pump	Blade, double-action, rotor type, driven by engine crankshaft							

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Front steerable wheels position	Wheel camber - 1°, lateral inclination of knuckle pin — 6°, toe-in — 1-3 mm							
Braking systems								
Service brake system	Dual-circuit with the air brake drive; 4Sx2M antilock brake system (ABS), drum – type wheel brake gears							
Emergency brake system	—ne of the service brake system circuits							
Parking brake system	Mechanical, with four spring brakes acting on the rear and intermediate axles wheels brake shoes; pneumatic drive; control by means of the manual brake valve							
Auxiliary brake system	Engine retarder, compression-type located in the exhaust system. Pneumatic drive with the simultaneous fuel cut-off to the engine							
Electrical equipment								
Wiring system	Single-wire, negative terminals of current source are connected with truck frame. Rated voltage 24 V							
Generator	4512.3771-10 2280 watt, with voltage regulator built in							
Storage batteries	TITAN STANDART 6CT1900L (ST) or 6CT-190N3							
Storage batteries switch	1402.3737, with remote control from cab							
Starter	5432.3708-01 or AZF 4581, with electro-magnetic starting relay with remote control							
Headlamp	671.3711							
Turn indicators and road train sign lamps	511-3726010 or YIIБ-1.1							
Front lamps	Two items, ПФ133-АБ, or ПФ130Б, two-sectional, with marker and turn indicator lamps							
Rear lamps	7442.3716-10 or 8502.3716-01 incorporating functions of the rear clearance light, turn indicator, rear outline lamp (marker light), stop signal, reversing light, rear fog lamp, light reflectors and side (marker) light							

Table 1 continuation

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
Number plate lamp	Two items, ФП131АБ-02, or ФП131БР-10								
Cabin and platform									
Cab	Three-seater, metal-made, equipped with heater, thermo-and noise insulation								
Platform body	Metal-made, drop and removable sides and rear				Metal-made, drop and removable sides and rear				
Platform inside dimensions, mm: length width sides height	4500 2462 600				5660 2462 600				
Special equipment									
Power take-off from gear-box*4	Mechanical, one-speed, air-actuated in 3 versions: - for mounting the HИИ-32У3Л left-hand pump - with flange for connecting cardan shaft with rear output. Output shaft speed of the power take-off is equal to 1,06 of engine crankshaft speed - with shaft having internal slots for connecting pumps (for delivery, the power take-off box flange is plugged by the technological cover)								

Table 1 ending

Parameters	Ural-4320-0111-61	Ural-4320-1151-61	Ural-43203-1151-61	Ural-4320-0911-60	Ural-4320-1951-60	Ural-5557-1151-60	Ural-55571-1151-60	Ural-44202-0311-60	Ural-44202-0511-60
	The takeoff power is 22 kilowatt (30 hp). The power taking-off during truck travelling with gear shifting is not admissible								
Auxiliary power take-off box * ⁴	Mechanical, air-actuated, engaged via sliding coupling from the transfer box primary shaft. Ensuring up to 40 % take-off of engine maximum output. Some modifications have heavy-duty power take-off box enabling 100% power take-off from the engine. Power take-off is allowed during traveling with appropriate reduction of traction-and-dynamic properties. Power take-off shaft speed is defined by the gearbox ratios and engine crankshaft speed, and it should be within 550 min-1 - 3000 min-1								
Winch* ⁴	Drum-type, with worm reduction gear and band brake driven via cardan shaft from the auxiliary power take-off. Rope working length 60 m, rope dia. 17.5 mm. Rope reversing is possible. Pulling power on the third rope winding layer 68,6-88,2 kN (7-9 tf) limited by the guard pin. The mass of the winch with the rope is 420 kg.								
Winch unit* ⁴	Rope-type, single-groove								
Tire pressure control system	Air is supplied via two-wire diagram. Tire pressure inflation, deflation and adjustment are separate for front and rear axles tires. Adjustment and control is carried out from the driver's cab								
* On V category roads.									
* ¹ For trucks and chassis with a winch.									
* ² Mass parameters allowable by the units and assemblies (agreed with the URAL Automobile Works OE JSC when making up «Protocol of using chassis on the customer product»). In addition, for some modifications, front axle load increases to 6500 kg, GVW increases to 22 500 kg.									
* ³ Reference fuel consumption is defined as per GOST 20306-90 and serves to determine the truck technical condition and is not an operational standard									
Контрольный расход топлива определяется по методике ГОСТ 20306-90.									
* ⁴ Installed upon request.									

Table 2 – 4x4 Trucks Technical Specifications

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
General data		
Payload, kg	4200	-
Payload on chassis, kg	-	5500
Truck (chassis) bare weight, kg	7955	6935
Total vehicle weight with cargo, driver and passengers (225 kg) disregarding the gross vehicle weight tolerance, kg	12 380	12 660/13 300* ²
Gross trailer weight, kg	7000/5000*	
Weight distribution of empty truck (chassis) with additional equipment and outfit, kg: on the front axle on the rear axle	4820 3135	4635 2300
Gross vehicle weight distribution, kg: on the front axle on the rear axle	5260 7120	5085/5300* ² 7575/8000* ²
Operational data		
Maximum travelling speed at gross weight, km/h	85	
Truck (chassis) estimated fuel consumption* ³ at speed of 60 km/h per 100 km, l, max	24	
Cruising range on truck (chassis) control fuel consumption at a speed of 60 km/h, km	854	
Braking distance with GVW when travelling at a speed of 60 km/h, m, max	36,7	
Maximum ascent, degrees, (%), no less than, GVW	58 (30)	
The least turning radius on the front outer wheel track axis (relative to the turning center), m, max	10,5	
Fordability (hard-bottom ford) at natural wave (not produced by the truck), m	0,7	

Table 2 continuation

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
Engine		
Model, type	YAMZ-65654, ignition by compression, four-stroke, turbocharged, 6-cylinder V-engine	
Operating capacity, l	11,15	
Rated capacity, kW (hp), no less than	169(230)	
Maximum torque, gross, N.m (kgf·m)	882(90)	
Speed, min ⁻¹	2100 ⁺⁵⁰ ₋₂₀	
Rpm corresponding to the max torque, min ⁻¹	1100-1500	
Engine lubricating system	Mixed, under pressure with injection and with the oil cooling in the liquid-to-oil heat exchanger	
Engine feed system Fuel tank, l	210 (refill capacity 206) or 300 (refill capacity 294)	
Engine air feed system	with dry air filter with the replaceable cardboard filtering element, air-cooling and with a contamination indicator	
Exhaust system	with the release from the turbo-charger backwards, pipeline with wearproof (auxiliary) brake, noise suppressor, the end of the exhaust pipe is directed to the truck axis	
Cooling system	hydronic, closed-type with forced-circulation of liquid coolants. Corrugated-vane radiator	
Transmission		
Clutch	YAMZ-183-15, friction clutch, dry, single-disk with a pull-out diaphragm spring, asbestos-free clutch linings, hydraulically operated, pneumo-hydraulic booster	
Gearbox	YAMZ-2361, mechanical, three-throw, five-gear, with speed synchronizers for the second, third, fourth and fifth gear	
gear ratios	first gear-5,22; second gear-2,90; third gear-1,52; fourth gear-1,00 fifth gear-0,664 or 0,71; reverse-5,22	
Transfer gearbox gear ratios	Mechanical, two-step blocked interaxle differential distributing the torque between the front and the rear axle with the 1:2 ratio, with the front axle drive high gear — 1,21 or 1,04 low gear — 2,15	

Table 2 continuation

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
Cardan drive	Exposed, with four shafts, joints on the needle bearings	
Axles	Driving, combined axle case consists of a cast middle part and half-axle casings pressed in it. The front axle is a steering one, with constant velocity joints of disk-type	
Main gear	Double, drive-through type, two conical spiral tooth gears and two cylindrical skew gears. Main gears of all axles are interchangeable	
gear ratio	Differential is symmetrical, conical with four pinions. Semi axles are fully offloaded, spline joint with the hub 6,77	
Frame	Running gear Stamped, riveted	
Towing devices	In the front: rigid towing hooks, in the rear: double-action towing unit	
Truck suspension: front	Conventional suspension on two semi-elliptic springs, operating jointly with two bilateral hydraulic snubbers	
rear	Conventional suspension on two semi-elliptic springs with helpers, operating jointly with two bilateral hydraulic telescopic snubbers	
Wheels	a) 533-310 (310-533) disk wheels with divided semi-deep rim, having toroidal bead seats, centered at the chamfers of the clamping holes, wheel offset 100 mm	
Tires	According to the truck package: a) 425/85R21 156G, (HC16/PR16) KAMA-1260 or model KAMA-1260-1 (with versatile tread pattern), pneumatic, radial, tubed, wide-section, with heavy-duty tread pattern, controllable tire pressure, max admissible load 39,46 kN (4000 kgf) or b) 425/85R21 156G, (HC16/PR16) Бел-1260, pneumatic, radial, tubed, with heavy-duty tread pattern, with controllable tire pressure, max admissible load 39,46 kN (4000 kgf) or	
	c) 425/85R21 , 156J (HC18/PR18) model O-184 pneumatic, tubed, conventional profile, with heavy-duty tread pattern, adjustable tire pressure, max admissible load 39,46 kN (4000 kgf)	

Table 2 continuation

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
Steering		
Type of transmission	Mechanical, with hydraulic booster	
Steering gear	MAZ – 64229 or RBL C-700 (Germany), «screw – ball nut-rack-sector» with hydraulic booster (for RBL C-700), steering drive with hydraulic booster (for MAZ – 64229)	
Booster unit	Hydraulic, double-action type	
Booster unit pump	Blade, double-action, rotor type, driven by engine crankshaft	
Front steerable wheels position	Wheel camber - 1°, lateral inclination of knuckle pin — 6°, toe-in — 1-3 mm	
Braking systems		
Service brake system	Dual-circuit with the air brake drive; 4Sx2M antilock brake system (ABS), drum-type wheel brake gears	
Emergency brake system	One of the service brake system circuits	
Parking brake system	Mechanical, with four spring brakes acting on the rear axle wheels brake shoes; pneumatic drive; control by means of the manual brake valve	
Auxiliary brake system	Engine retarder, compression-type located in the exhaust system. Pneumatic drive with the simultaneous fuel cut-off to the engine	
Electrical equipment		
Wiring system	Single-wire, negative terminals of current source are connected with truck frame. Rated voltage 24 V	
Generator	4512.3771-10 2280 watt, with voltage regulator built in	
Storage batteries	TITAN STANDART 6CT190OL (ST) or 6CT-190N3	
Storage batteries switch	1402.3737, with remote control from cab	
Starter	5432.3708-01 or AZF 4581, with electro-magnetic starting relay with remote control	
Headlamp	671.3711	
Turn indicators and road train sign lamps	511-3726010 or УПБ-1.1	
Front lamps	Two items, ПФ133-АБ, or ПФ130Б, two-sectional, with marker and turn indicator lamps	

Table 2 continuation

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
Rear lamps	7442.3716-10 or 8502.3716-01, bearing functions of the rear marker lamp, turn indicator, rear outline (marker) lamp, stop lamp, reverse lamp, rear fog lamp, reflector light and side marker light	
Number plate lamp	Two items, ФП131АБ-02, or ФП131БР-10	
Cabin and platform		
Cab	Three-seater, metal-made, equipped with heater, thermo-and noise insulation	
Platform body	Metal-made, drop and removable sides and rear	
Platform inside dimensions, mm: length width sides height	3900 2462 600	
Special equipment		
Power take-off from gearbox * ⁴	Mechanical, one-speed, air-actuated in 3 versions:	
	- for mounting the HIII-32Y3JI left-hand pump - with flange for connecting cardan shaft with rear output. Output shaft speed of the power take-off is equal to 1,06 of engine crankshaft speed.	
	- with shaft having internal slots for connecting pumps (for delivery, the power take-off box flange is plugged by the technological cover)	
	The takeoff power is 22 kilowatt (30 hp). The power taking-off during truck travelling with gear shifting is not admissible	
Auxiliary power take-off box * ⁴	Mechanical, air-actuated, engaged via sliding coupling from the transfer box primary shaft. Ensuring up to 40 % take-off of engine maximum output. Some modifications have heavy-duty power take-off box enabling 100% power take-off from the engine. Power take-off is allowed during traveling with appropriate reduction of traction-and-dynamic properties. Power take-off shaft speed is defined by the gearbox ratios and engine crankshaft speed, and it should be within 550 min-1 - 3000 min-1	

Table 2 ending

Parameters	Ural-43206-0111-61	Ural-43206-1151-61
Winch* ⁴	Drum-type, with worm reduction gear and band brake driven via cardan shaft from the auxiliary power take-off. Rope working length 60 m, rope dia. 17.5 mm. Rope reversing is possible. Pulling power on the third rope winding layer 68,6-88,2 kN (7-9 tf) limited by the guard pin. The mass of the winch with the rope is 420 kg	
Winch unit* ⁴	Rope-type, single-groove	
Tire pressure control system	Air is supplied via two-wire diagram. Tire pressure inflation, deflation and adjustment are separate for front and rear axles tires. Adjustment and control is carried out from the driver's cab	
* Mass when operating on V category roads *¹ For trucks and chassis with a winch. *² Mass parameters allowable by the units and assemblies (agreed with the URAL Automobile Works OE JSC when making up «Protocol of using chassis on the customer product»). In addition, for some modifications, front axle load increases to 6500 kg, GVW increases to 22 500 kg. *³ Reference fuel consumption is defined as per GOST 20306-90 and serves to determine the truck technical condition and is not an operational standard. *⁴ Installed upon request		

Overall dimensions of the trucks are shown in Fig. 6-16. The dimensions marked by an asterisk are given for trucks of fully loaded mass.

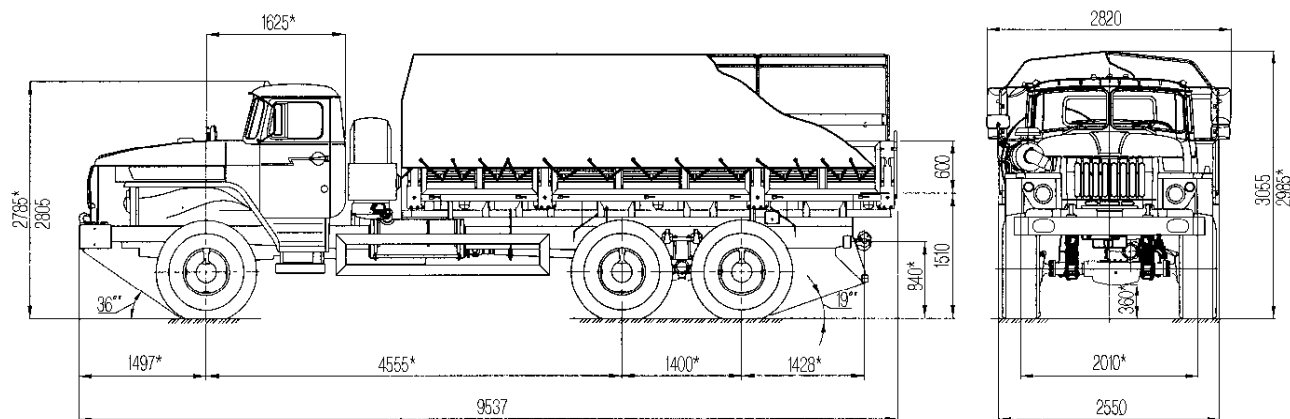


Fig. 6 – Ural-4320-0911-60 truck overall dimensions

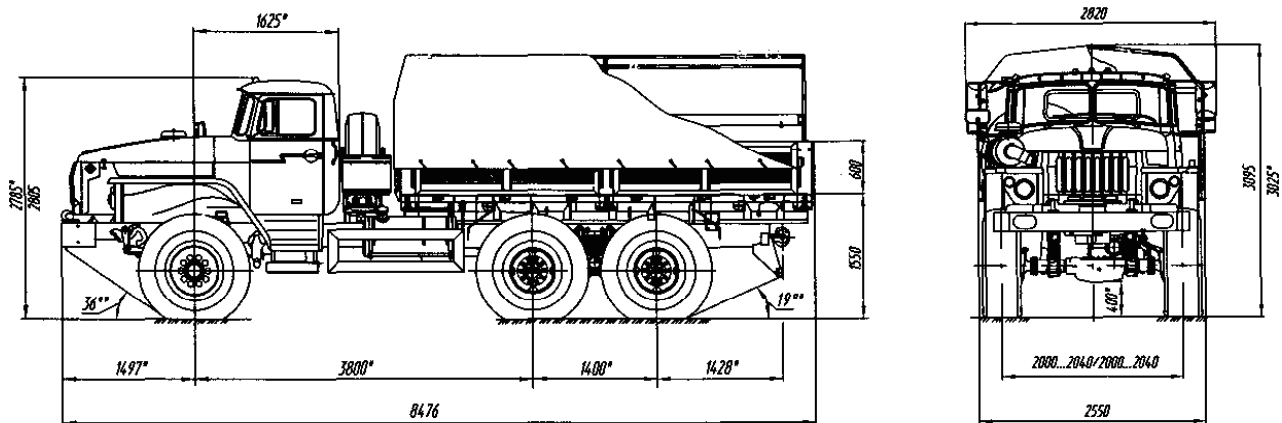


Fig. 7 - Ural-4320-0111-61 truck overall dimensions

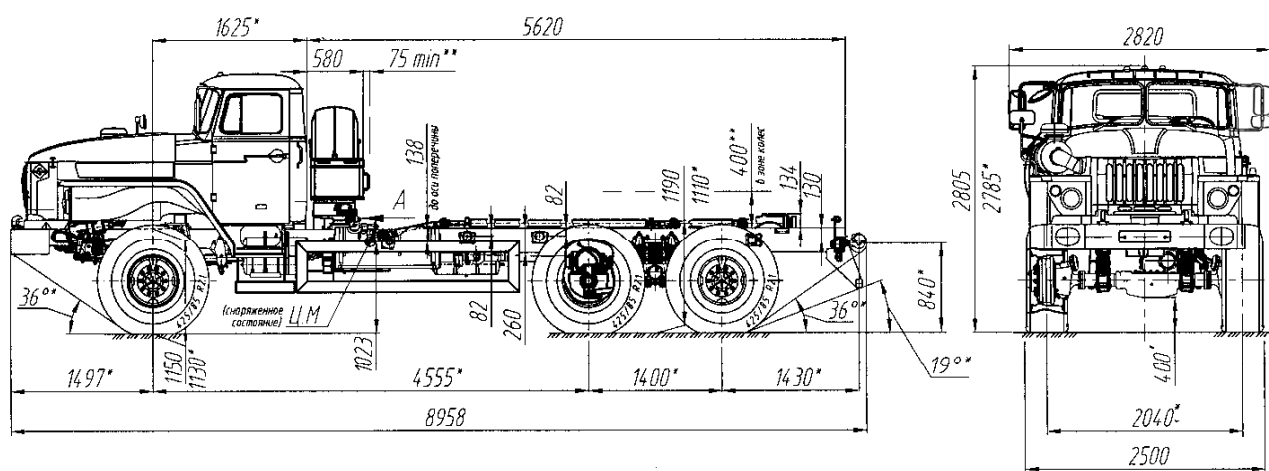


Fig. 8 - Ural-4320-1951-60 truck chassis overall dimensions

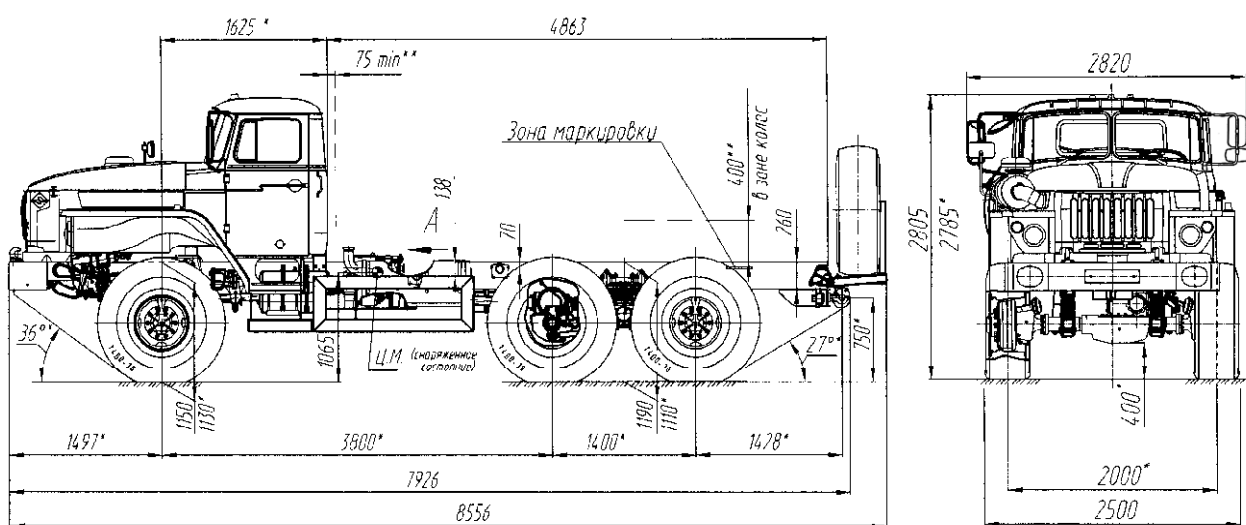


Fig. 9 - Ural-43203-1151-61 truck chassis overall dimensions

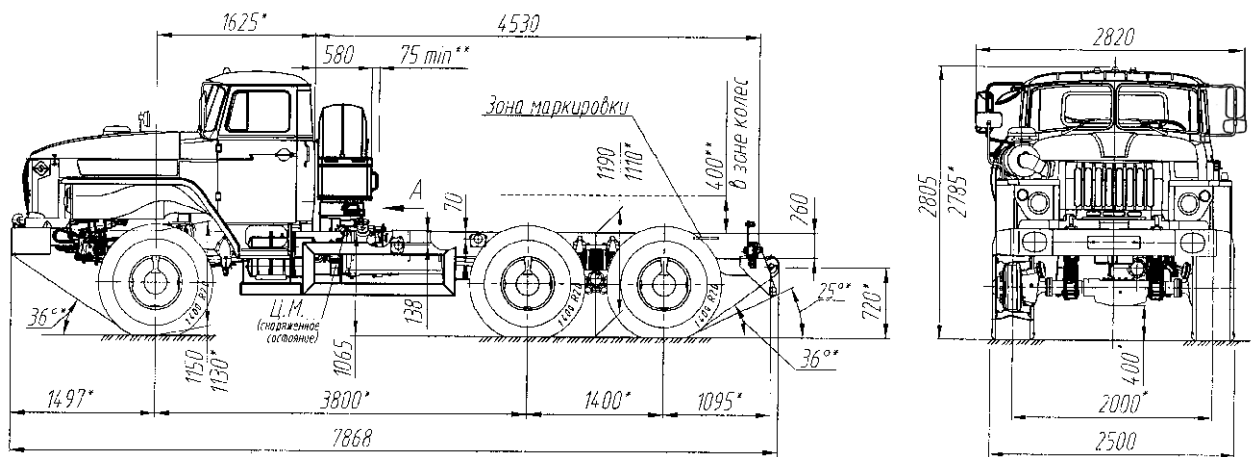


Fig. 10 - Ural-4320-1151-61 truck chassis overall dimensions

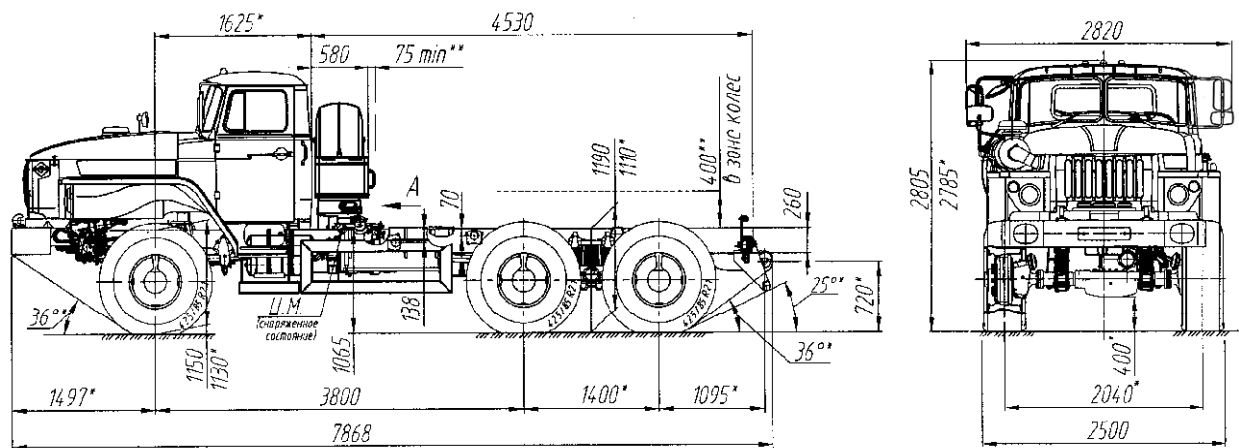


Fig. 11 - Ural-55571-1151-60 truck chassis overall dimensions

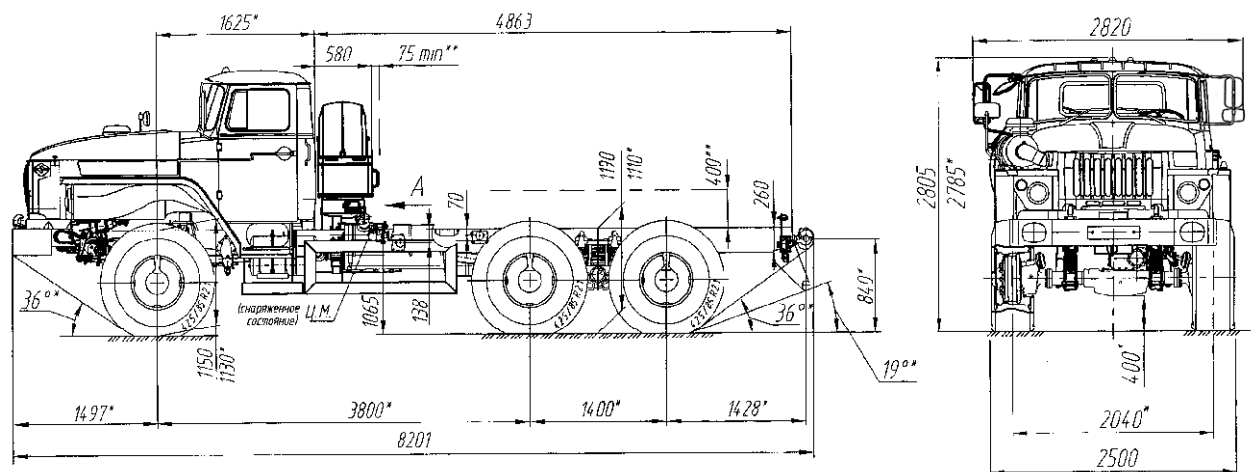


Fig. 12 - Ural-5557-1151-60 truck chassis overall dimensions

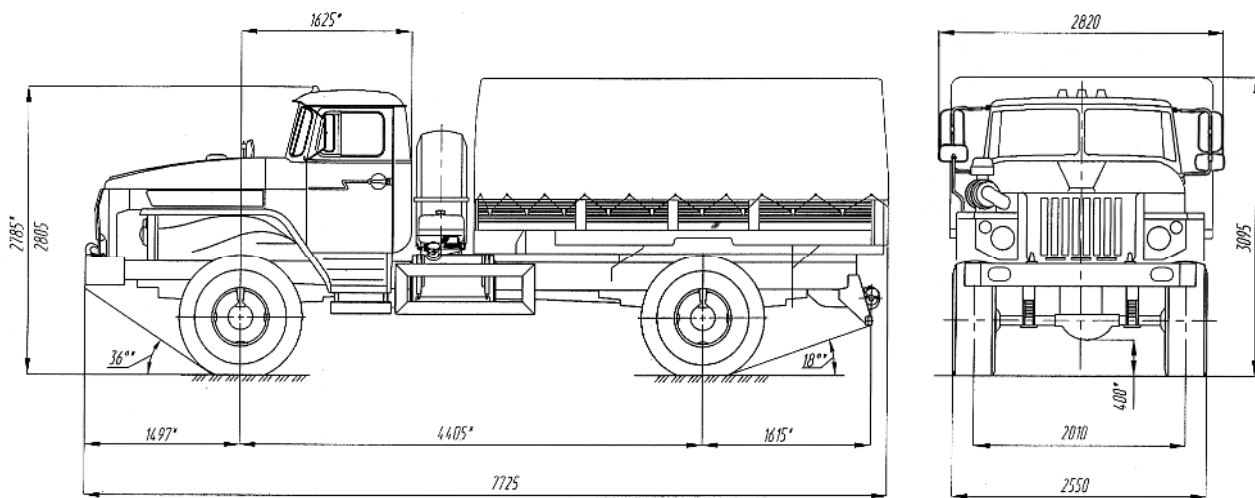


Fig. 13 - Ural-43206-0111-61 truck chassis overall dimensions

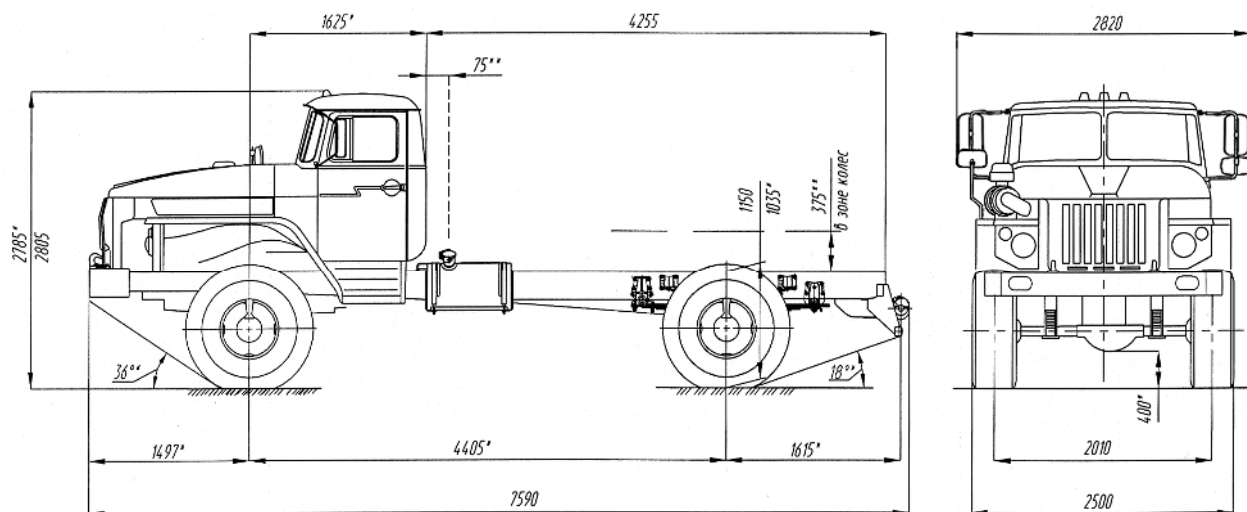


Fig. 14 – Ural-43206-1151-61 truck chassis overall dimensions

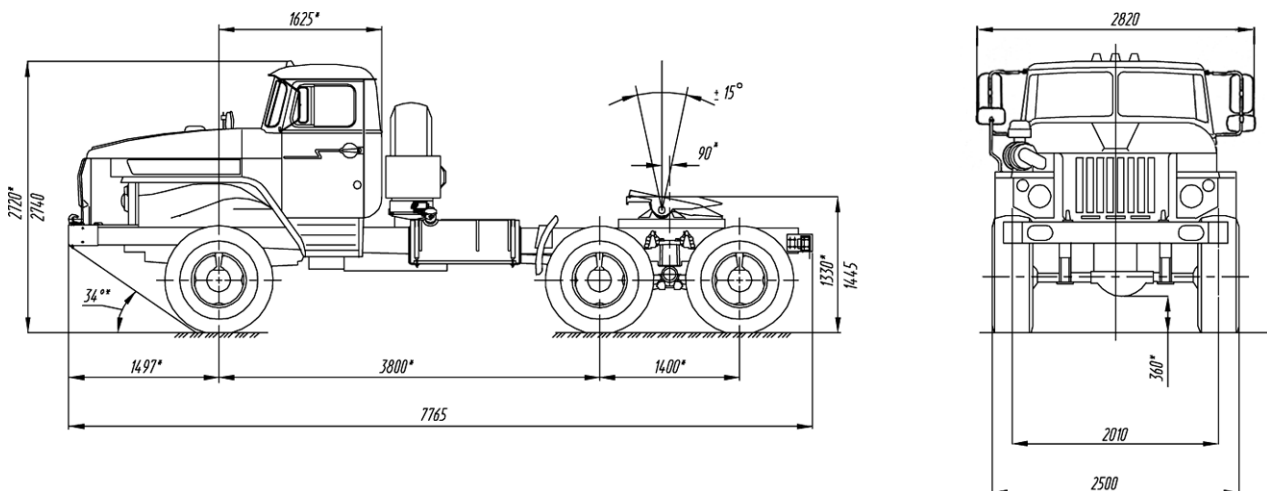


Fig. 15 - Ural-44202-0311- 60 bolster trucks

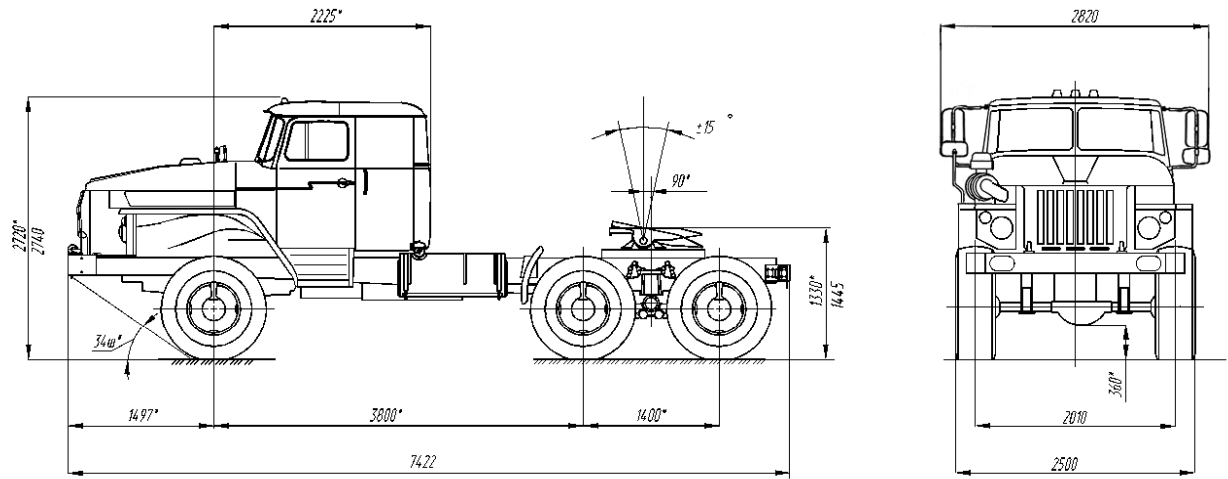
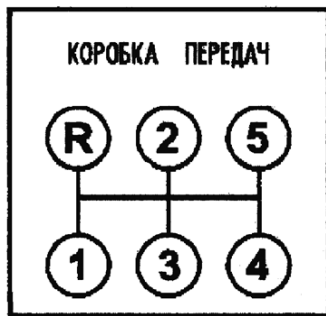


Fig. 16 - Ural-44202-0511-60 bolster trucks

4 Controls and Instruments

4.1 Controls and instruments located in the driver's cab are shown in Fig. 17-20. Shift gears in the gearbox according to the scheme shown in Fig. 17.



1-5-gears; R-reversing

Figure 17 – Gear Shifting Scheme

Engage the gearbox, transfer case and differential lock as well as the power take-off, auxiliary power take-off according to the plates inside the cab and in accordance with the instructions of the Section «Driving Technique».

When pressing transfer case gear shifting key switch 31 (Fig. 19) on the control panel in the cab (the key has three fixed positions: high gear, neutral gear and low gear), the required gear is chosen but not engaged. In order to engage the gear, press transfer case gear engagement button 30 and hold it depressed for 5-7 sec, by this the solenoid valves deliver the air into the transfer case gear shifting mechanism and the gear is engaged.

When the low gear is engaged, the indicator 33 lights up.

When the button 29 of transfer case differential locking with «» symbol is pushed, the solenoid valve of the transfer case differential locking is activated; when the button 23 of power take-off engagement with «» symbol is pushed, the solenoid valve of power take-off is activated; when the button 24 of auxiliary power take-off engagement with «» symbol is pushed, the solenoid valve of auxiliary power take-off is activated; When the button 28 of cross-axle differential locking with «» symbol is pushed, the solenoid valve of the cross-axle differential locking is activated. Solenoid valves deliver air to the transfer case differential locking mechanism, power take-off box, auxiliary power take-off box, intermediate and rear axles mechanisms, by this indicators light up and the mechanisms are engaged.

The starter and instruments switch 11 (Fig. 18) is located on the steering column and has three key positions:

- 0 - “off”, the position is fixed, the key can be removed;
- I - the instruments are turned on, the position is fixed, the key cannot be removed;
- II - the instruments and starter are on, return to position I is automatic, the key cannot be removed.

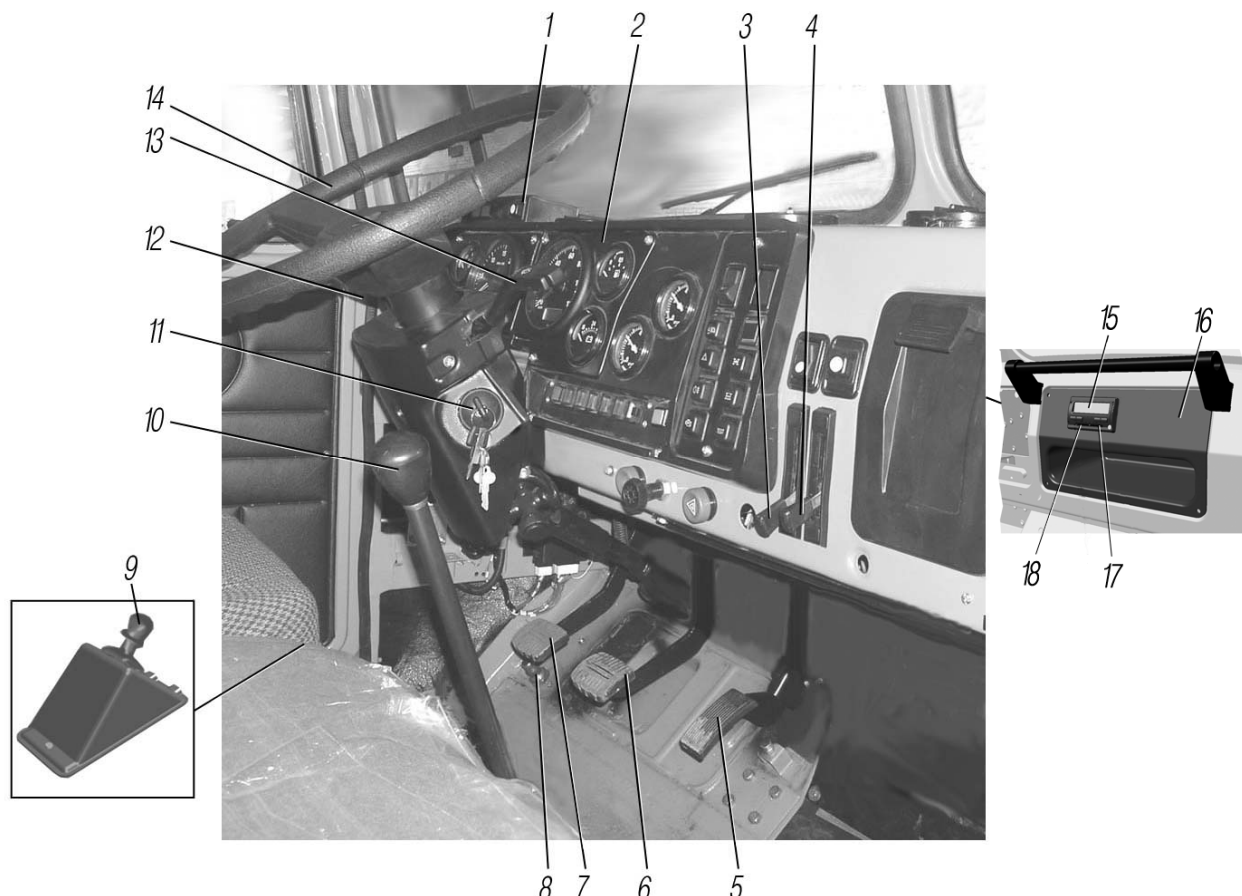
The starter and instruments switch 11 consists of the contact part and lock part. The lock part has blocking device making the starter repeated turning-on at the running engine impossible.

When the key is removed from the lock, the locking rod moves out and goes into the steering gear shaft slot, locking the shaft.

Caution! Do not remove the key from the starter and instruments switching lock at truck travelling!

Make sure the steering is locked once the key is removed from the lock. When significant effort is applied for the turning the key from the «0» position, rock the steering wheel to the left and to the right

The switch 12 has five operating positions: forward — right turn; rear — left turn; up (not fixed) — headlamp upper beam flashing; intermediate — headlamp low-beam; down — headlamp upper beam; the button on the switch is for horn.



1-antilock brake system (ABS) control panel; 2-dashboard; 3-heating air distributor shutter control lever; 4-inner hatch lever; 5-electronic fuel feed control pedal; 6-brake pedal; 7-clutch pedal; 8-auxiliary brake control button; 9-parking brake lever; 10-gear shift lever; 11-starter and instruments switch; 12-under steering wheel left switch of turn indicators, headlamp beams, horn; 13-under steering wheel right switch of windshield wiper and washer; 14-steering wheel; 15-tachograph*; 16-glove compartment; 17-reader 1; 18-reader 2

Figure 18 - Controls and Instruments

When under steering wheel right switch 13 is moved downwards the horn is activated; when it is moved towards the driver the windshield washer is activated; when it is moved upwards the windshield wiper is activated.

* not installed on chassis-cab

Parking brake lever 9 is located to the driver's seat right side. When the lever 9 handle is pulled until it is latched the parking brake system is activated – BRAKES APPLIED position. For releasing the brakes, pull the lever from the latched position and push it down till it stops – BRAKES RELEASED position.

Auxiliary brake is applied by depressing the button 8, when the driver moves the foot from the button the braking ends.

The supply of the outer air is adjusted by the lever 3 movement. When the lever 3 is in the upper position, the air blows onto the windows through deflectors; the air blows to warm the driver and passengers feet at the lower position of the lever.

The inner hatch is opened at the upper position of lever 4; it is closed at the lever lower position.

Tachograph 15 design description and operation and service instructions are given in the Digital Tachograph Operation Manual supplied with the truck.

Speedometer 8 according to the Fig. 19 shows the truck travelling speed and the counter installed in it shows the truck total run.

Engine crankshaft speed is monitored by a tachometer 7. When the tachometer shows no readings, switch on any load (heater, instruments illumination etc.); by this tachometer shows crankshaft speed.

The fuel level in the main tank is shown by indicator 11. Its scale has an integrated indicator 10 which lights up when the fuel volume is less than 60 l.

Air pressure in the brake air drive is monitored by two-pointer gauge; valve outlets which portable pressure gauges can be connected to are provided for checking air pressure in each circuit.

Storage batteries are switched on and off by pressing a switch 37.

Trucks are equipped with centralized tire inflation system; a plate of tire inflation system concerning the choice of tire pressure and travelling speed depending on the type of road is located inside the cab on the front panel to the right side.

Tire inflation is controlled by switches 17,19 and monitored by pressure gauges 13. The switches have three positions:

- inflation;
- deflation;
- neutral position – in which pressure gauges 13 and 13a indicate actual tire pressure.

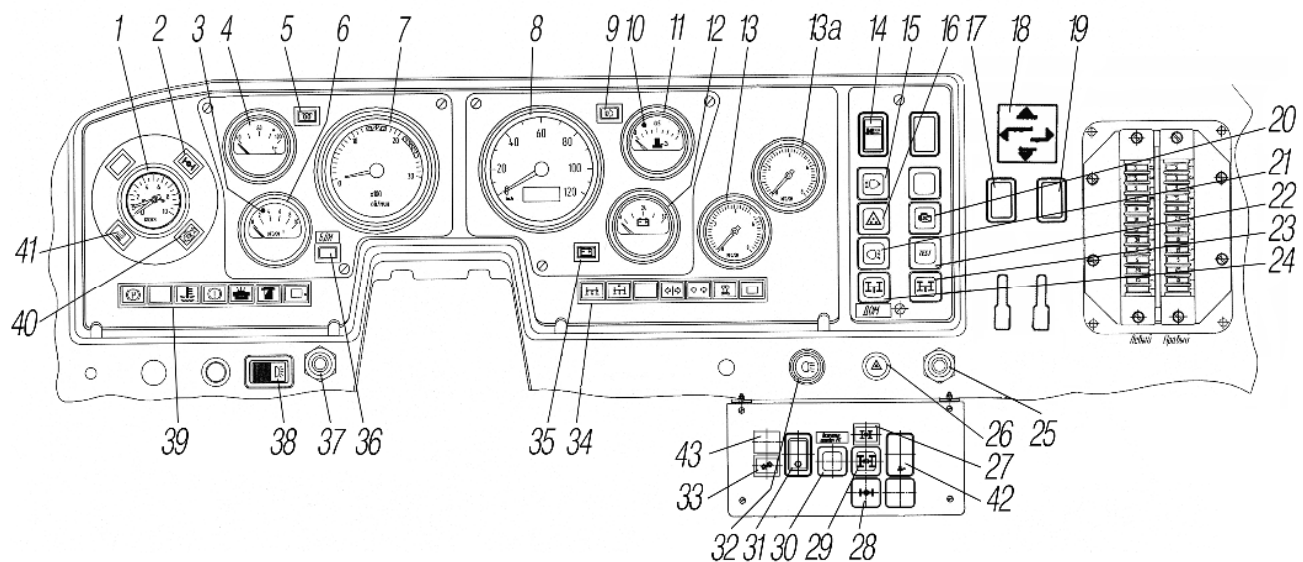
The lamps 36 (IEU) and 40 (EDC) light on at turning the starter and instrument switch key to the position I (instruments are on, position is fixed, key cannot be removed); by this Interface engine unit (IEU) and Electronic diesel control (EDC) unit are being examined. Lamps 36 & 40 go out when the diagnostic process is over.

If the lamp 36 is still lighting, the failure occurs in Interface engine unit (IEU). To find and eliminate the failure, press the switch the switch 22 shortly and read the light codes in accordance with Interface engine unit (IEU) Operation Manual.

If the lamp 40 is still lighting, the failure occurs in Electronic diesel control (EDC) unit. To find and eliminate the failure, press the switch the switch 20 shortly and read the light codes in accordance with Addendum «YAMZ-6565, YAMZ-65651, YAMZ-65652, YAMZ-65653, YAMZ-65654 engines and their modifications» to «YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236-БЕ2, YAMZ-236БЕ, YAMZ-236Б Power Units Operation Manual».

Emergency flashing is turned on by pushing switch 26: all turn indicators lamps and a lamp in the button start flashing.

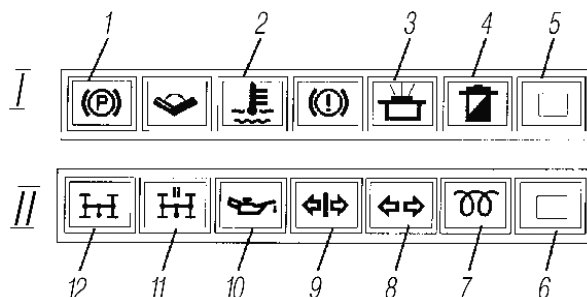
To check fuel level in the main tank, shift the fuel level indicator switch 42 upwards; to check the fuel level in additional tank, shift the fuel level indicator switch 42 downwards.



1-two-pointer pressure gauge; 2-cross-axle differential lock indicator; 3-oil emergency pressure drop indicator; 4-coolant temperature indicator; 5-air starting preheater indicator; 6-oil pressure indicator; 7-electronic tachometer; 8-electronic speedometer; 9-headlamps upper beam indicator; 10-fuel reserve indicator; 11-fuel level indicator; 12-voltage indicator; 13-front circuit tire pressure gauge; 13a-rear circuit tire pressure gauge; 14-cab heater modes switch; 15-swiveling spotlight switch *; 16-roads train sign light switch; 17-front circuit tires inflation control switch; 18-tire inflation and deflation plate; 19-rear circuit tires inflation control switch; 20-electronic diesel control (EDC) diagnostics switch; 21-rear fog light switch; 22-Interface Engine Unit (IEU) diagnostics switch; 23-power take-off switch; 24-auxiliary power take-off switch; 25- glow-plug preheater switch; 26-emergency flashing switch; 27- interaxle differential lock indicator; 28-cross-axle differential lock switch; 29-interaxle differential lock switch; 30-transfer case gears engagement button; 31- transfer case gear shifting key switch; 32-central light switch; 33-transfer case gears indicator; 34,39-pilot lamps left and right clusters; 35-storage battery discharge indicator; 36-Interface Engine Unit (IEU) diagnostics indicator; 37-storage batteries switch; 38-cab dome light switch; 40-electronic diesel control (EDC) diagnostics indicator; 41-air filter clogging indicator; 42-fuel level indicator switch; 43- neutral gear engagement indicator

Figure 19 – Controls and Instruments Panel

Glow-plug preheater* operates at constantly depressed button 25. Indicator 7 (Fig. 20) lighting up indicates that glow-plug preheater is ready to start the engine. When buttons 5, 6 are depressed, all the intact pilot lamps of the left- or right-hand unit glow.



Pilot lamps of: 1-parking brake; 2-coolant temperature emergency rise; 3-minimum air pressure in the air system; 4-oil filter clogging; 5,6-pilot lamp test buttons; 7-glow-plug preheater actuation*; 8-truck turn-indicators; 9-trailer turn-indicators*; 10-oil emergency pressure in the engine; 11-auxiliary power take-off engagement*; 12- power take-off engagement*, I-left-hand unit; II-right-hand unit

Figure 20 – Pilot Lamp Assembly

* Installed upon request

Pilot lamp 8 shows flickering green-color light after the truck left- or right-turn indicator has been switched on, Pilot lamp 9 lights up after the trailer left- or right-turn indicator has been switched on. These indicators are also intended for checking the turn-indicators lamps.

If the air pressure in reservoirs drops below 450 kPa (4,5 kgf/cm²), lamp 3 glows with red-color light and the warning signal is head.

If resistance of the oil filter rises (clogging of the filtering element, solidifying of oil at low temperatures), lamp 4 glows with red light. Check that the lamp lights only when the engine is started or warmed. Coolant temperature alarm rise pilot lamp 2 glows with red-color light, if the coolant temperature rises above 90°C. It is allowed to run the engine for a short time (10 minutes maximum) at the temperature of up to 95° C.

Pilot lamp 1 glows with red-color light when the parking brake is applied.

5 Truck components adjustment and servicing (brief description)

5.1 Engine

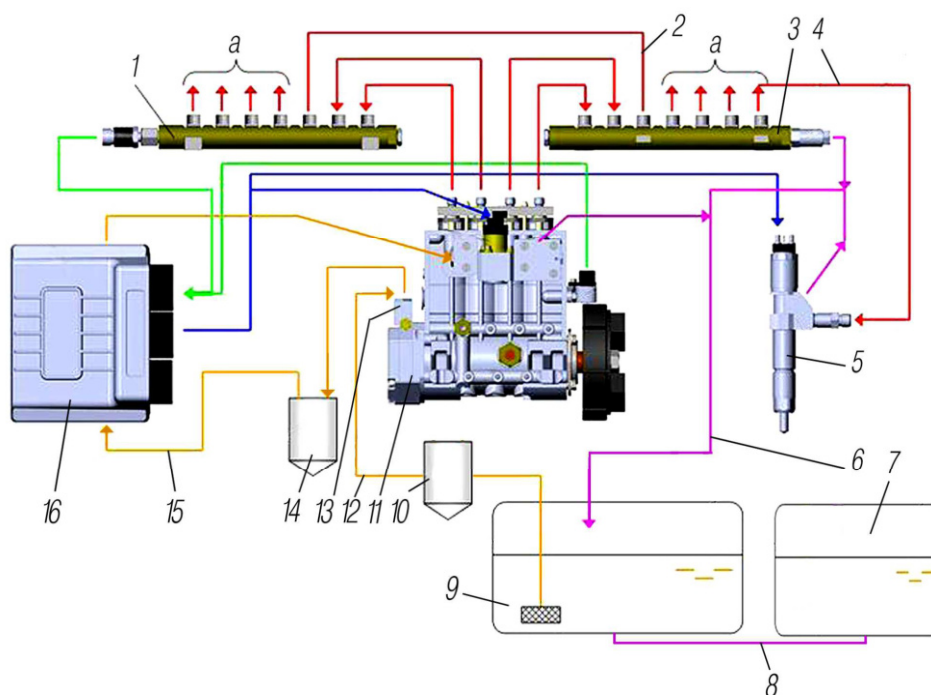
Description of engine design as well as instructions for engine operation and maintenance are given in the Operation Manual issued by the Yaroslavl Motor Works.

5.1.1 Fuel system

5.1.1.1 Engine Fuel System. Fuel is taken from main fuel tank 9 (Fig. 21) by fuel feed pump 13 and is supplied to high-pressure fuel pump (HPFP) 11 via coarse-mesh filter 10 and fine-mesh filter 14. The fuel pump delivers fuel under pressure to accumulators 1 and 3 (ramp) and then to the nozzles which inject fuel into engine cylinders. The injection is controlled by the engine EDC. Excessive fuel together with air which has entered the system is returned via piping 6 to the fuel tank.

The fuel volume in the main fuel tank is measured by an electrical level gauge installed in the tank and is controlled by the indicator on the dashboard. The fuel level sensor in the auxiliary fuel tank depends on vehicle modification. In case the fuel level sensor is installed on the auxiliary fuel tank, there is a fuel level indicator switch in the cabin.

The main fuel tank is on the left frame sidemember, the auxiliary fuel tank is on the right frame sidemember.



1,3-high-pressure accumulator; 2,4- high-pressure fuel pipes; 5-injector; 6-drain line fuel pipes; 7-auxiliary fuel tank; 8-connecting fuel line; 9-main fuel tank; 10-coarse filter; 11-high-pressure fuel pump (HPFP); 12,15-low-pressure fuel lines; 13-low-pressure fuel pump; 14-fine-mesh fuel filter; 16-electronic control unit; a-fuel lines to injectors

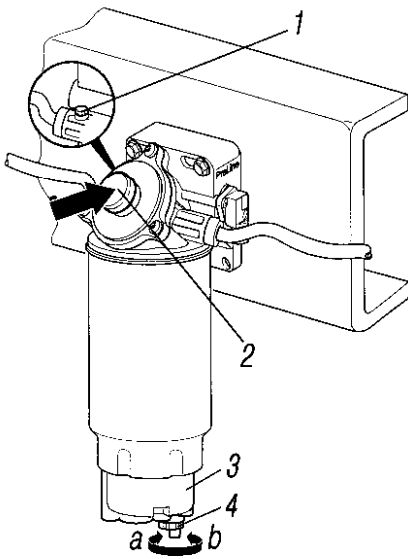
Fig. 21 - Engine Fuel Feed System Diagram

Manual fuel boost pump installed in the PreLine-420 coarse filter is used to pump the fuel through at engine start. To deliver fuel to the high pressure fuel injection pump 11 with engine stopped (after long parking and feed system fuel piping disassembly) fill in the fuel supply system by pressing the manual fuel pump 2, as shown in Figure 22.

5.1.1.2 Coarse Filter PreLine-420 is mounted on the fuel tank front bracket.

Feed System filling with fuel:

- Unscrew the ventilation opening threaded plug 1 (Fig. 22);
- Manual fuel boost pump 2 is used to pump the fuel through. Keep pumping through until there is no air coming out of the ventilation opening plug 1;
- Screw the ventilation opening threaded plug 1 to $6 \pm 1 \text{ Nm}$ torque ($0,6 \pm 0,1 \text{ kgf} \cdot \text{m}$).



1- ventilation opening plug; 2- manual fuel boost pump; 3- water tank; 4- drain hole plug; a- open; b- closed

Fig. 22 - Coarse Fuel Filter

5.1.1.2.1 Water drain. Draining the collected water is required when the drainage container is filled or when the filter insert is to be replaced.

5.1.1.2.2 Risk of Freezing. Drain off the water to avoid freezing.

When draining water from the coarse filter:

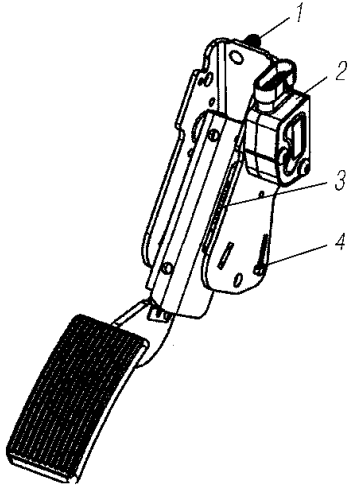
- Shut off the engine to avoid air ingress in the fuel system;
- Unscrew the drain hole threaded plug 4 at the bottom of water tank 3 and let water drain off;
- Screw the drain hole threaded plug 4 again.

5.1.1.2.3 Filter replacement:

- Shut off the engine;
- Dismantle the old replaceable filter. The old replaceable filter is likely to fit tightly to the filter head (use proper tools);
- Lubricate the new filter gasket with a few drops of motor oil;
- Screw the filter by hand till the gasket fits;
- Tighten up manually to make the filter fit tightly (about $3/4$ of a turn);
- Unscrew the ventilation opening threaded plug 1;
- Use the manual fuel boost pump 2 to pump the fuel. Keep pumping till air stops oozing out of the ventilation opening threaded plug 1.
- Screw the ventilation opening threaded plug 1 to $6 \pm 1 \text{ Nm}$ torque ($0,6 \pm 0,1 \text{ kgf} \cdot \text{m}$).

5.1.1.3 Accelerator Electronic Pedal. The pedal has a rh sensor 2 (Fig. 23) transmitting the signal to the engine fuel system in proportion to the pedal angular travel.

There are two studs 1 for the pedal attachment 1. The pedal spring 3 provides the pedal return in its initial position. The pedal travel angle at the engine idle revolutions is 18 °. The pedal travel is limited by the stop 4.



1-M8 studs; 2-pedal sensor; 3-return spring; 4- stop

Fig. 23 - Accelerator Electronic Pedal

5.1.1.4 Engine Air System serves to withdraw air from atmosphere, clean the air from dust and deliver the air to the engine. It consists of a two-stage air filter, supply pipelines, connecting hoses and fixing elements. The air filter is fitted on the right-hand truck fender by means of brackets and clips. The inlet pipelines are located on the filter.

Air is supplied to the air filter via the air suction pipe. Air received in the filter due flow-ing through the swirler obtains rotary motion in the annular gap between the housing and filter element; under centrifugal force dust particles are thrown to the housing wall and collected in the dust bin through a slit in the baffle. Then, the preliminary cleaned air flows through the filter element, where it is cleaned finally. The purified air from the air filter via air ducts to the turbo-charger. From the turbo-charger the air is delivered via the air duct to the charge air cooler, where it is cooled and after that it gets to the engine cylinders. There is a hose in the engine air feed system, bypassing the crankcase blow-by gases from the engine, and there is also a hose for air delivery to the air compressor.

In order to enhance the filtration efficiency of the air getting into engine and to increase the service life of the filter, a primary filter installation is provided in the air filter.

Service the first stage of the air filter periodically, according to the truck operating condi-tions. The necessity of filter element maintenance should be determined by the readings of the air filter clogging indicator located in the driver's cab. When the indicator flashes it is necessary to service the air filter.

For the first stage air filter servicing remove the air lines, the cover, unfasten the latches, remove the cardboard filtering element, the air filter and clean the dust in the compartment. Rinse the housing and the cover using diesel fuel or hot water, blow through with compressed air and dry.

Inspect the filtering element of the air filter. Dust deposit on the inner side of the element indicates faulty sealing of the element or sealing disks; in this case replace the element.

When assembling the air filter check the sealing quality with a continuous imprint on the gasket.

For the filter element servicing remove the precleaner and remove dust through shaking or blowing. If the cardboard filter element is covered with dust without a fume or carbon black deposit (the element is gray in color), blow it with dry compressed air till the dust is completely removed. To prevent cardboard break, do not exceed the compressed air pressure limit of 200-300 kPa (2-3 kgf/cm²). Direct the air jet at an angle with the surface and adjust the air jet force by varying the distance between the hose and the element.

If soot or oil are seen on the cardboard, or if the blow-over with compressed air proves ineffective, wash the element in warm water (40-50 °C) with a detergent dissolved in it (such as household detergents) at the rate of 20-25 g of the substance per 1 L of water. Immerse the element in the solution for half an hour, then rotate or dip it vigorously during 10-15 min. After washing in the solution, rinse the element in fresh water and dry. Do not dry it above open fire or in air heated over 70 °C.

After each servicing or fitting a new element a visual inspection of its condition should be made, illuminating it with a bulb.

Replace the element if mechanical injuries, cardboard broken corrugations or ply separations are evident.

The estimated service life of the cardboard filter element is 30 000 km. More frequent cleaning of the filtering element might reduce its service life, since total attempts of element servicing are limited (to 5-7 attempts including washing 3 times maximum) because of possible cardboard disruption.

A periodic inspection of corrugated and smooth hoses connecting rubber is necessary. Replace the parts in case of defects like fractures, cuts, disruptions.

5.1.2 Engine Starting Preheating System

5.1.2.1 Engine starting preheating system is intended for warming the engine at negative ambient temperatures.

Technical data of starting preheater

Model	ПЖД30Ж
Heating capacity, kW (kcal/h)	30 (26 000)
Fuel	as used for engine
Fuel consumption, kg/h кг/ч	4,2

Engine starting preheating system comprises:

- starting preheater consisting of: heater boiler 11(Fig. 24), pump unit 15 (electric engine, fan, hydraulic and fuel pumps); high-voltage source;
- fuel tank 1 with cock 2;
- preheater control console comprising switches of electric fuel heater, plug, pump unit and solenoid valve. The console is located on the cooling system radiator left side;
- pipelines;
- gas branch pipe 8;
- oil sump casing 6.

The removable burner is bolted to the heat exchanger. Plug 7, solenoid valve 10 in assembly with the injector and electric fuel heater 9 are fitted on the burner.

The solenoid valve cuts in and off the fuel to the burner.

The injector fitted in the solenoid valve body sprays fuel needed for combustion.

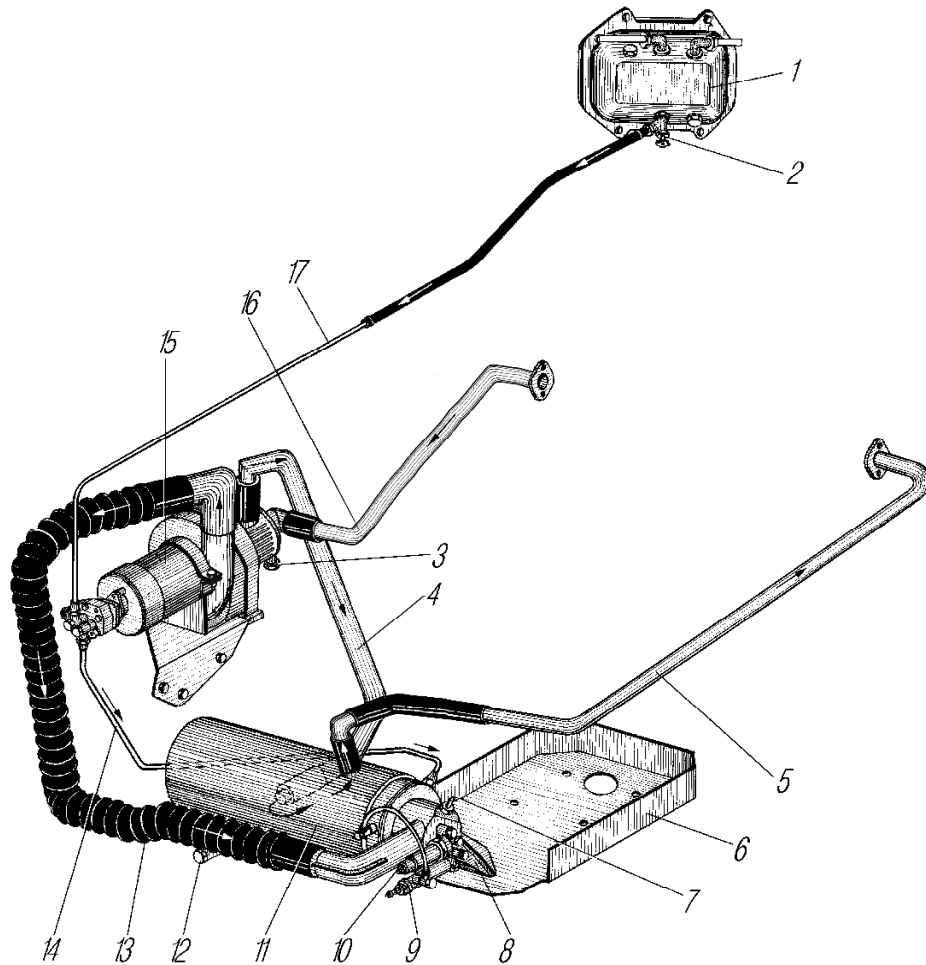
The electric heater warms the fuel portion before starting the preheater.

The electric spark firing system ensures inflammation of fuel and air mixture during starting .

The fuel tank contains the fuel stock required for preheater operation. It is connected with engine fuel system via fuel lines, and is always filled with fuel when the engine runs. If need be, it can be filled by means of the engine's manual fuel feed pump.

The preheater operates as follows: The fuel pump takes fuel from the preheater tank and injects it into the burner under pressure, with solenoid valve opened. In the burner fuel mixes with air, gets ignited and burns, heating the fluid in the heat exchanger. The fluid is forced by the pump through the pipelines, through cylinder block in the direction shown by arrows in Fig. 22.

Combustion products are directed via the gas branch pipe under the engine oil sump and warm oil in it. Fuel is cleaned when passing the filters provided in the solenoid valve and injector.



1-fuel tank; 2-straight-way valve; 3,12-drain plugs; 4-feed pipe of the preheater boiler; 5-feed pipe; 6-oil case housing; 7-spark plug; 8-gas driving nozzle; 9-fuel electric heater; 10-electric magnetic valve; 11-heater boiler; 13-air hose; 14-fuel pipe between the pump unit and the boiler; 15-pump unit; 16-outlet pipe; 17-fuel pipe between the heater boiler and the pump unit

Fig. 24 - Engine Starting Preheating System

5.1.2.2 Starting Preheater Service. Remember that violating the operation rules as well as operating a faulty preheater may cause fire. See that there is no coolant and fuel leaks through the joints of pipelines, hoses and cocks; see that the clips on the heat exchanger branch pipes and pipelines are tight.

After truck washing or ford passing remove water which entered the preheater air duct by operating the pump unit during 2-3 min.

Take care that the preheater fuel pump is adjusted correctly.

When preparing the truck for winter operation, proceed as follows:

- screw the transport plug out of the fuel pump drain hole. When returning to summer operation, screw it in;

- open the cock of the preheater fuel tank and leave it opened throughout the winter period of operation. When returning to summer operation, close the fuel cock;

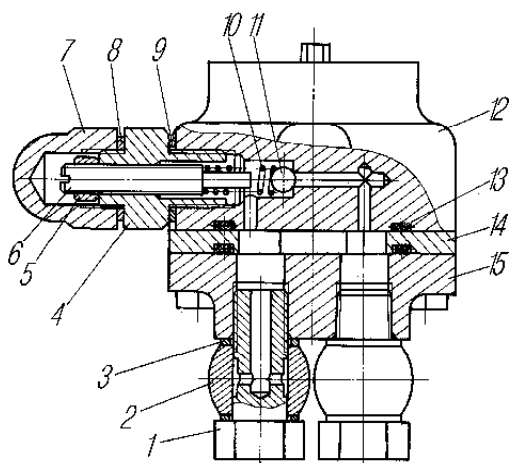
- check the heat exchanger and pump unit for proper fastening, clean all the instruments of dirt; check the wires for good condition and the control console for proper fastening. Clean the heat exchanger gas duct and combustion chamber. For this purpose disconnect the air supply hose and blow through the heat exchanger, combustion chamber and gas duct. Clean the drain pipe of the heat exchanger burner in order to eliminate fuel accumulation;

- remove carbon deposit from the electrode and insulator of the spark plug. Disassemble and wash in kerosene or acetone the injector and its fuel filter as well as the solenoid valve fuel filter;

- check the preheater fuel pump for correct adjustment. The optimum fuel feed to the combustion chamber is determined in service by a steady preheater operation with no flame ejection out of the heat exchanger.

The fuel consumption should be adjusted by the fuel pump reduction valve (Fig. 25). To change the fuel volume supplied through the injector, screw out cap nut 7 on the fuel pump, unlock adjusting screw 6 and turn the latter to the right for increasing, and to the left for decreasing of the fuel feed.

Preheater operation with naked flame at the outlet is not allowable. On completion of the adjustment lock the adjusting screw with lock nut 5 and screw on cap nut 7.



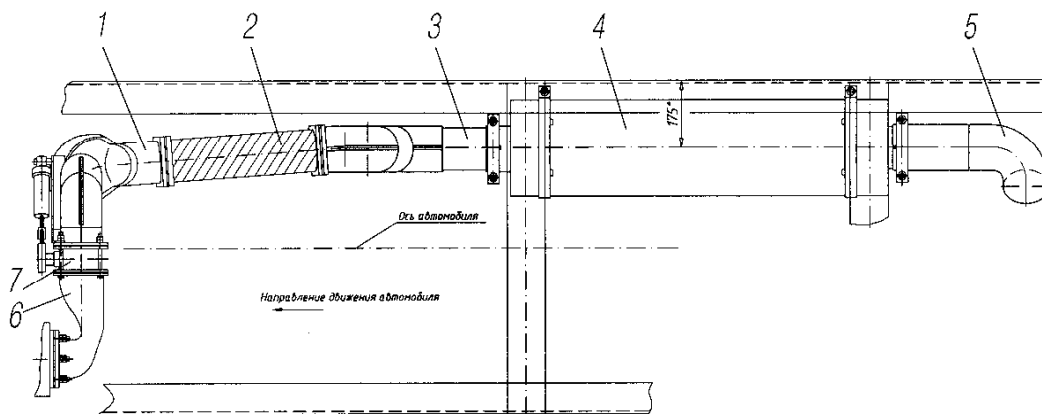
1- fuel line bolt; 2- swivel elbow; 3,8,9,13-packing rings; 4-union; 5,7-nuts; 6-adjusting screw; 10-spring; 11-ball; 12-fuel pump body; 14-spacer; 15-fuel pump cover

Fig. 25 - Fuel Pump Reduction Valve

5.1.3 Exhaust System

The exhaust system is designed for exhaust gas output and exhaust noise reduction. There is an auxiliary brake 7 between the exhaust manifold 6 on the engine turbocharger and the inlet pipe 1 (Fig. 26); in order to equalize temperature changes of the parts dimensions and the mutual offset of the engine and the silencer, there is a flexible metal hose 2 behind the front pipe.

The exhaust silencer 4 is fixed by two attachment clips with the supporting brackets on the 2d and the 3d frame cross bars. The exhaust pipe 5 is directed inwards to the vehicle base angularly 40-60°.



1-silencer inlet pipe; 2-metal hose with flanges; 3-silencer intake pipe; 4-exhaust silencer; 5-outlet pipe; 6-exhaust branch; 7-auxiliary brake

Fig. 26 - Gas Exhaust System

5.1.4 Cooling System

The engine cooling system (see Fig. 27) is of liquid, closed type, with a fan viscous clutch built-in; switching on in accordance with the air flow; with forced circulation of the coolant designed for all-season application of the low-freezing coolants.

The coolant analogs and replacements are to be used in accordance with the «YAMZ-6565, YAMZ-65651, YAMZ-65652, YAMZ-65653, YAMZ-65654 Engines and their kitting-up» Addendum to the Operation Manual «YAMZ-236HE2, YAMZ236HE, YAMZ-236H, YAMZ-236-BE2, YAMZ-236BE, YAMZ-236B Power plants».

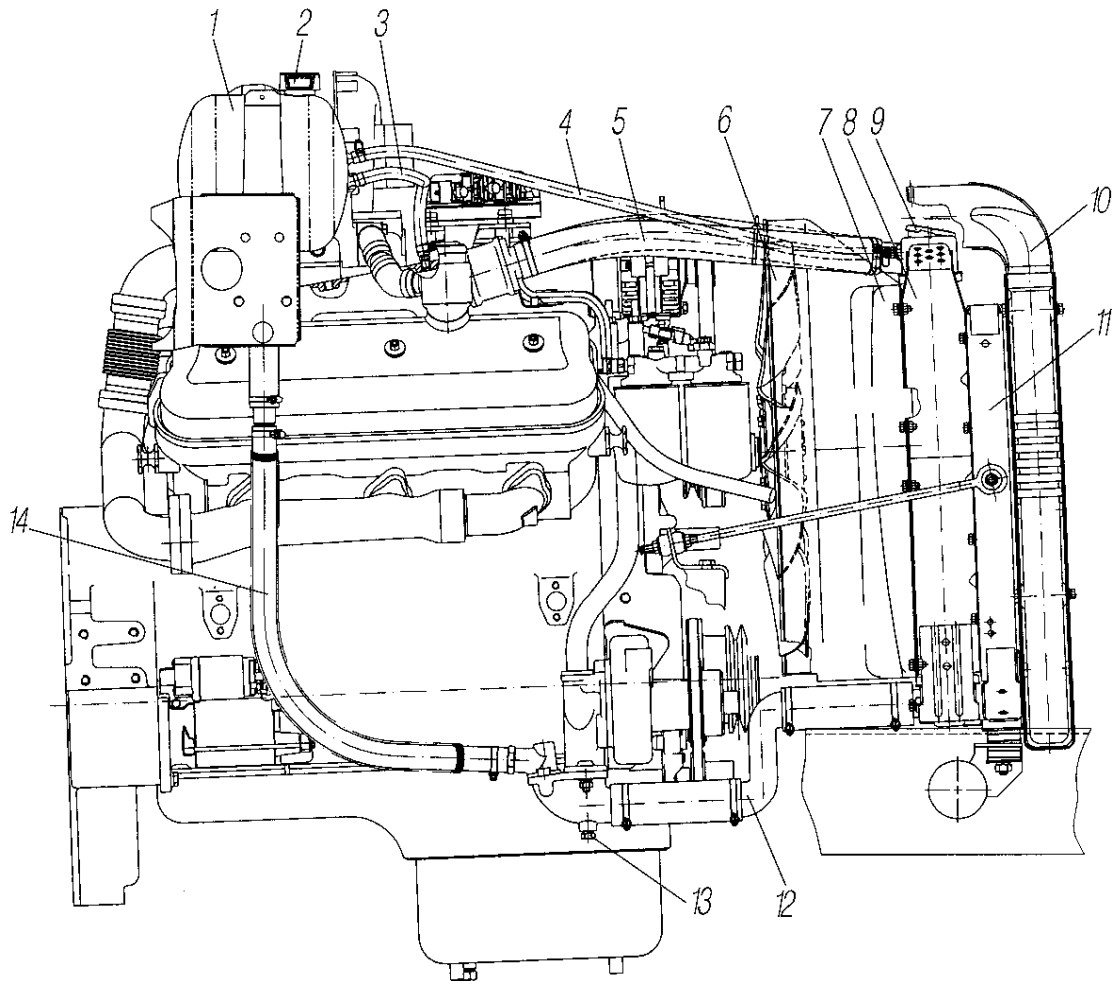
5.1.4.1 Radiator 14 is of tubular band type, three-line, with a filler. A tight plug provided with the filler. There is a drain plug in the low radiator tank. The radiator is installed on the frame 11 which is a bearing element. The radiator has a casing 7.

Before the engine cooling system filling, open the cowling, fill the coolant through the radiator filler 9 till the filler lower edge with the cab heating system valve open. Start the engine for 1 – 2 minutes the air from the system. If necessary, after the engine stop, add the coolant to the filler lower edge and screw the plug in tightly. After that, add more coolant through the expansion tank filler 1 to the «MAX» on the tank surface; screw the plug 2 in tightly.

5.1.4.2 Expansion tank 1 serves to compensate volume changes of coolant as the latter expands during its heating as well as for air and vapor removal from the coolant. The expansion tank plug 2 is provided with two valves. The gauge pressure in the system being 65 kPa (0.65 kgf/cm²) the outlet valve opens and lets excessive steam pass to the atmosphere, while the inlet valve opens at a pressure of 1-1.2 kPa (0.01-0.012 kgf/cm²).

Truck operation with no expansion tank plug is prohibited!

The material the cooling system expansion tank is made of allows checking coolant level in the tank visually.



1-expansion tank; 2-expansion tank plug; 3-steam hose from the engine; 4- steam hose from the expansion tank; 5-water return hose; 6-fan; 7-casing; 8-radiator; 9-filler with radiator plug; 10- charge air cooler; 11- radiator frame; 12-water supply branch pipe; 13-drain plug; 14- water supply piping from the tank to water pump

Fig. 27 - Cooling System Diagram

5.1.4.3 Monitoring the coolant temperature in the cooling system is carried out using the temperature gauge.

When the temperature increases in the cooling system over a 90 °C, the coolant temperature alarm lights up.

With burning alarm, further travelling is possible with careful observation of the coolant temperature gauge. A short, no more than 10 minutes, temperature rise to 100°C is possible.

5.1.4.4 To drain the coolant from the cooling system place the truck flat, or inclined forward, and unscrew the plug located in the lower radiator tank, the cab heater valve and plug in the heater boiler and pump unit.

In doing so, the plug of the expansion tank filler should be open. The estimated volume of the coolant not drained with the cab heater's cook being open amounts to 2 l.

Do not run engine upon draining the coolant to remove the remaining water from the system. That can cause failure of rubber packing rings of cylinder liners, falling out of valve seats, burning-through and distortion of block heads.

5.1.5 Power Unit Suspension

The power unit is mounted on four resilient supports: front, rear and two centre supports — left and right.

The front and intermediate supports are carrying ones. Rear support is of bearing type, mounted in unloaded condition using adjusting plates 9, according to Fig. 28. The power unit is mounted on beams 3 and 11 with its front and rear supports, with centre — on the brackets which are secured to the truck frame.

Brackets 2, 7, 12 serve as supports for the power unit. Front support bracket 12 is secured to the engine block front cover, while centre support brackets 2 — to the flywheel housing, and rear support bracket 7 to the rear end face of the gearbox.

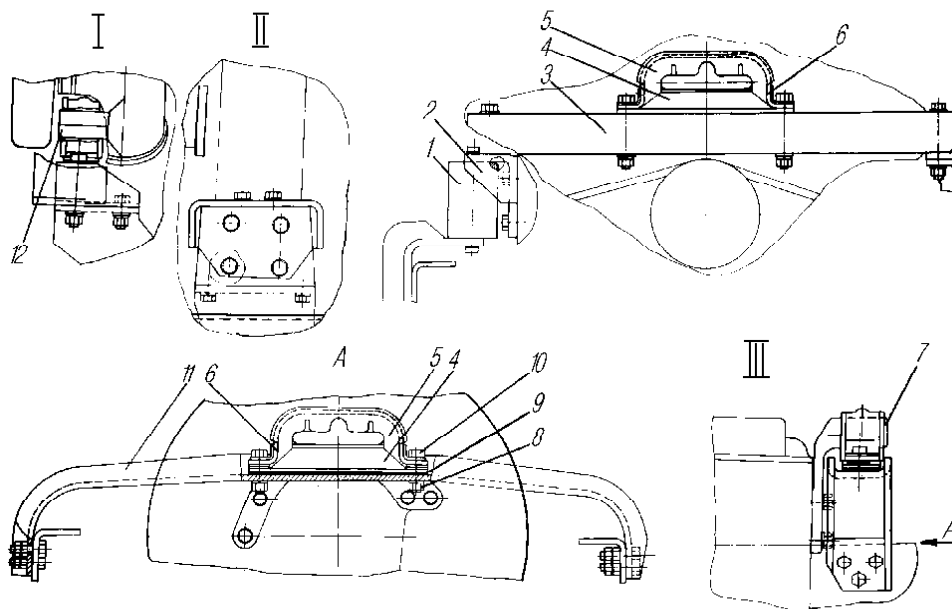
Cushions 1 of the left-hand and right-hand centre supports are interchangeable.

Also cushions 4 and shock absorbers 5 of the front and rear supports are interchangeable.

0-1 mm clearance between cushion 4 and rear support bracket 7 should be maintained to mount the rear support in unloaded condition.

For this purpose perform adjusting in the following sequence of operations:

1. Unscrew nuts 8 and undo bolts 10.
2. Remove adjusting plates 9.
3. Measure the clearance between bracket 7 and cushion 4. A clearance exceeding 1 mm should be eliminated by using adjusting plates 9.
4. Fit bolts 10 and tighten nuts 8.



1-intermediate support pad; 2-intermediate supports bracket; 3-front support beam; 4-front and rear supports pads; 5-front and rear support shock absorber; 6-front and rear support bracket; 7-rear support bracket; 8-nut; 9-adjusting plates; 10-bolt; 11-rear support beam; 12-front support bracket; I- front support; II-intermediate support; III-rear support

Fig. 28 - Power Unit Suspension

5.2 Transmission

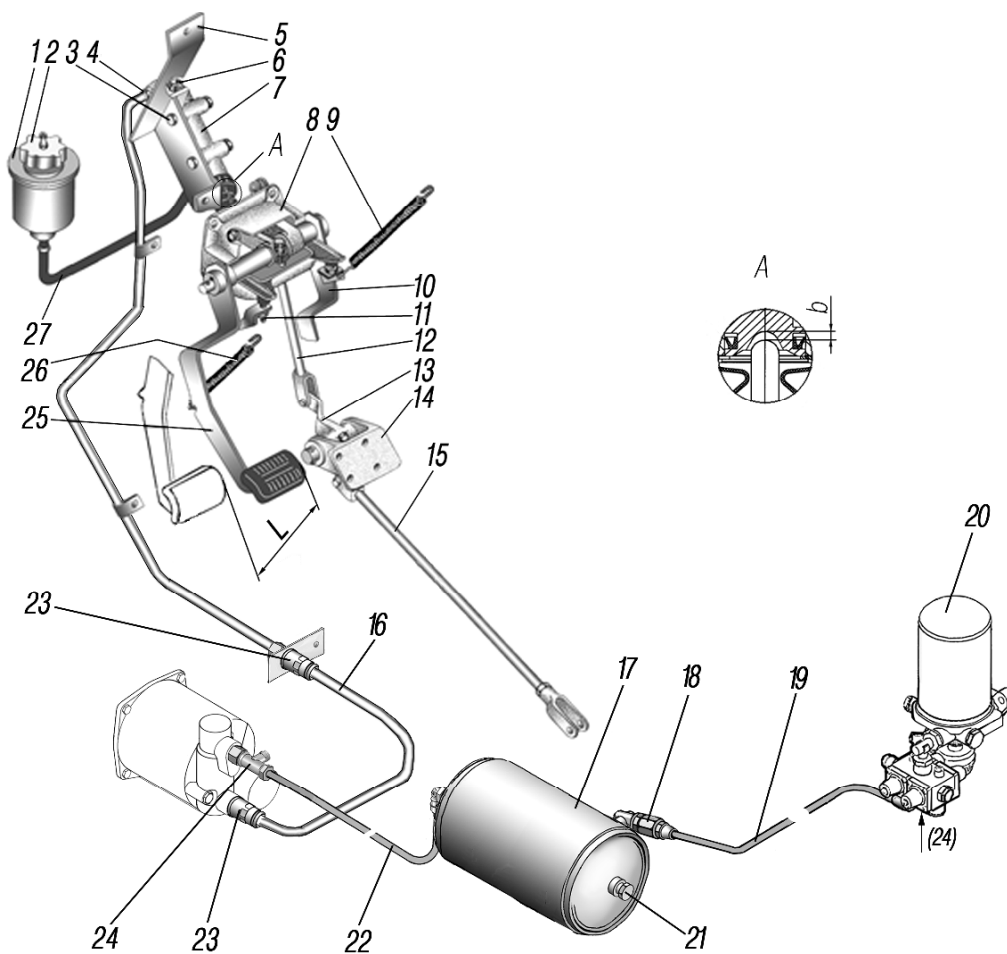
The description of clutch and gearbox design as well as instructions for their operation and maintenance are given in the Operation Manual by Yaroslavl Motor Works.

5.2.1 The Hydraulic Clutch Linkage with the Air-over-Hydraulic Booster (AHB)

5.2.1.1 The master cylinder 7, (Fig. 29), is located in the engine compartment and is mounted on the bracket to the cab front panel.

When the clutch pedal is pressed down, the liquid pressure from master cylinder is delivered through piping 16 to the Air-over-Hydraulic Booster (AHB). The liquid in the AHB pushes the rod and opens the pneumatic system valve simultaneously.

The pneumatic part comprises the 10 liter receiver 17, installed inside the left side-member, back-pressure valve 18 and piping. The air from the separate pneumatic part flows into the AHB.



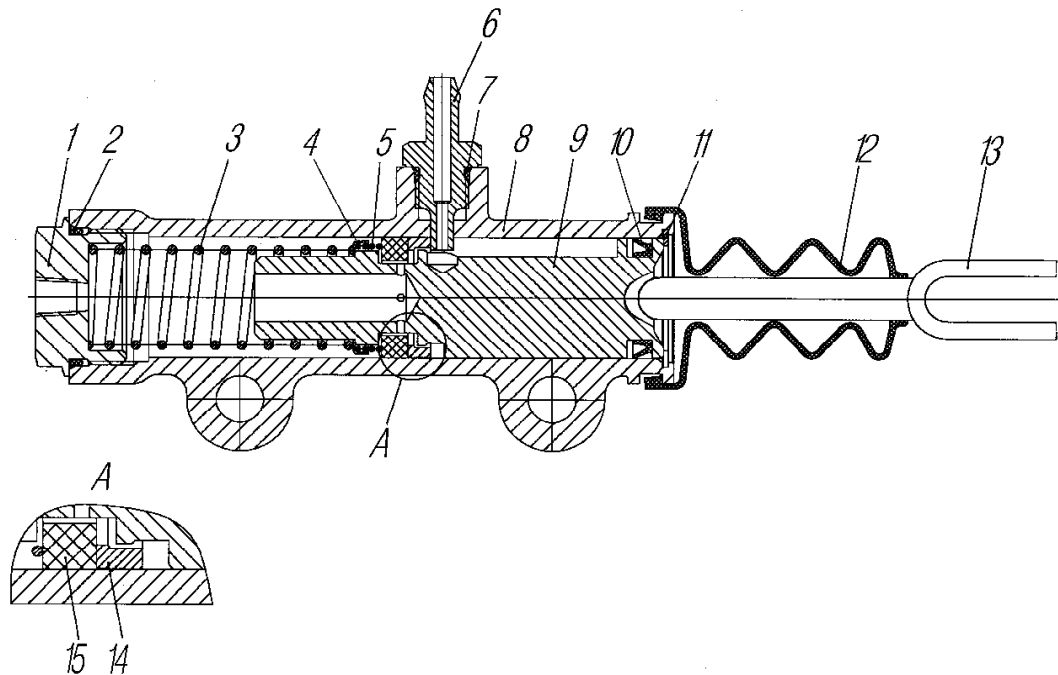
1-reserve tank; 2-tank cap; 3-bolt; 4-nut; 5,14-supporting brackets; 6-cylinder stop; 7-master cylinder; 8-pedal mechanism; 9,26-springs; 10-brake pedal; 11-clutch pedal stop; 12, 15-brake pedal rods; 13-brake valve control lever; 16-hydraulic drive pipeline; 17-nonbrake consumer receiver; 18-back-pressure valve; 19,22-piping; 20-moisture-and-oil separator with four line valve; 21-plug; 23-hydraulic fitting; 24- T-joint; 25-clutch pedal; 27- hose pipe; pedal full travel $L=185-190\text{mm}$; b-clearance

Fig. 29 - Clutch Release Control

The back-pressure valve 18 is installed on the receiver and designed for dividing the air-pressure line going from the separate pneumatic system circuit to the receiver for maintaining pressure inside the system irrespective of the pressure drop in the main circuits. The AHB is supplied with air through the pipe 19.

5.2.1.2 Clutch master cylinder. During maintenance or assembly install the ring 14 as shown in Fig. 30.

Lubricate the inner surface of the cylinder, as well as the rubber rings and the cup packing with brake fluid when assembling.



1-plug; 2,7-rubber rings; 3-pull-back spring; 4-supporting spring cup; 5-supporting spring; 6-inlet connection hose; 8-cylinder barrel; 9-piston; 10-cup packing; 11-locking ring; 12-protecting cover; 13-pushrod; 14-ring; 15-packing ring

Fig. 30 - Master Cylinder

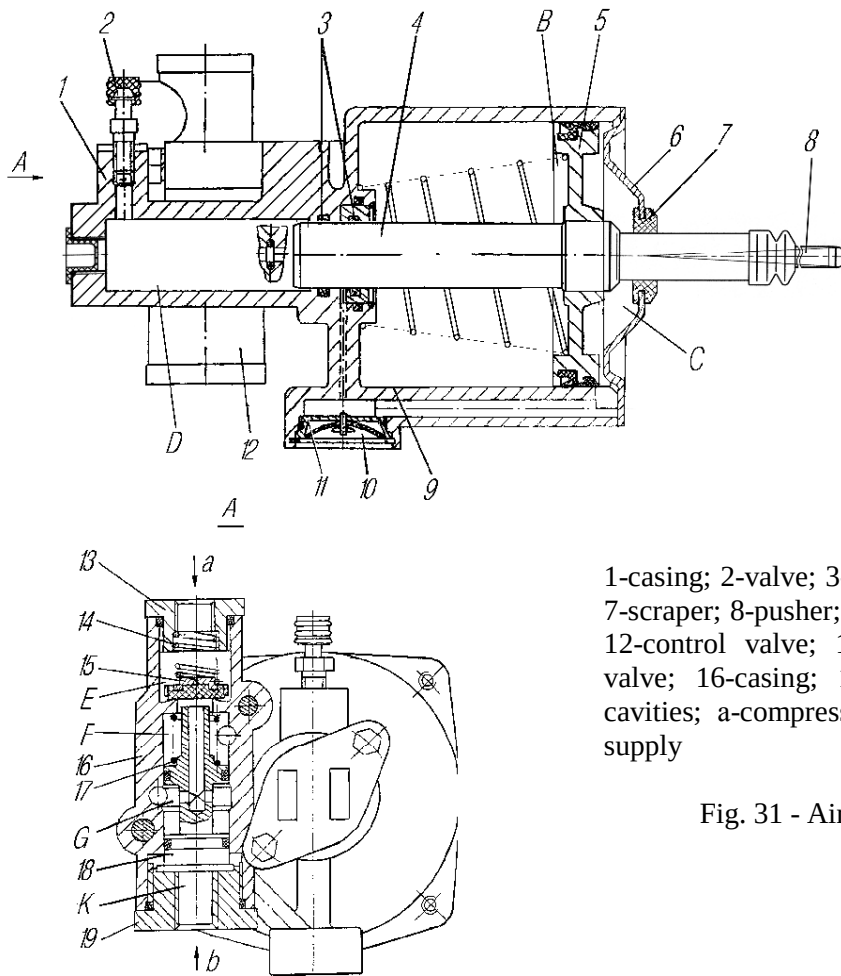
5.2.1.3 The air-hydraulic clutch booster (AHB) has the casing 1 (Fig. 31) which contains the piston 5 and the rod 4. The piston and the rod are flexibly packed in the case and can move in axial direction. The piston is packed in the body with the rubber cup packing 9, and the rod is packed with two rubber packing rings 3.

The case is closed with the cap 6 from the piston side, with the rod running through it. The fork 8 is fixed at the end of the rod, attaching the AHB to the clutch release fork lever. The rubber scraper 7 in the centre of the cap 6 cleans the rod and protects the inside of the casing from dirt.

The exhaust port 10 in the lower part of the casing has a rubber valve. It protects the inside of the casing from dirt.

The valve 2 in the upper part of the casing removes air from the cavity D. AHB control valve is attached to the casing 1 with two screws; the valve consists of the casing 16, plugged from both sides with the plugs 13 and 19. The slide valve 18 and the air valve 15 are inside the casing 8. The slide valve is flexibly packed in the casing with two rubber rings and sprung to the casing with the cylindrical coil spring 17. The spring 17 pushes the slide valve 18 from the air

valve against the stop to the plug 19. The slide valve has an axial bore and a radial bore connecting the cavities F and G.



1-casing; 2-valve; 3-seal ring; 4-rod; 5-piston; 6-cap; 7-scraper; 8-pusher; 9-collar; 10-outlet port; 11-plug; 12-control valve; 13,19-plug; 14,17-spring; 15-air valve; 16-casing; 18-slide valve; B,C,D,E,F,G,K-cavities; a-compressed air supply; b-working fluid supply

Fig. 31 - Air-hydraulic clutch booster

The air valve 15 is pressed to the valve seat inside the casing by the spring 14, disconnecting the cavity E from the cavity F. The unit bore system connects the cavity B with the cavity F and connects the cavities C and G with the exhaust port. The cavities K and D are interconnected with the bores. The piping connects the cavity K to the master hydraulic clutch release cylinder through tapping in the plug 19. The piping connects the cavity E to the air tank through tapping in the plug 13. The cavity E has the exhaust air output for the booster drive control.

5.2.1.4 Clutch pedal adjustment. When the system is fully pumped and there is no compressed air in the pneumatic drive section, adjust in the following way:

- loosen the locknut 11 (Fig. 29) and tighten it against the stop into the pedal;
- move the clutch master cylinder 7 to the upper position in the oblong holes of the supporting bracket 5;
- using the support 6 and the screws 3 fix the master cylinder;
- press the clutch pedal up to the stop;
- check when you release the clutch (it should be correct);
- if it is not, release the clutch by moving the master cylinder by 1/2 revolutions of the support 6 and by loosening the screws 3;

- tighten the screws 3 of the master cylinder 7 with the torque 44-56 N.m (4.4-5.6 kgf.m);
- adjust the pedal free travel with the help of the trip 11. The clearance between the push rod 13 (see Fig. 30) and the piston should be $b=0.2-0.6$ mm which corresponds to the pedal travel of 1-3 mm.

5.2.1.5 Priming. During the brake fluid change or in case of faulty hydraulic part of the drive, prime the system in the following order:

- fill the reverse tank 1 with brake fluid (Fig. 29);
- remove the protective valve cap 2 (Fig.31), put the priming hose on the valve, unscrew the valve by 1/2-3/4 revolutions and dip the hose end into the glassy container with the brake fluid;
- loosen the nut 4 (Fig.29) and tighten it when the first fluid drops appear;
- press the clutch pedal 25 abruptly when the valve is open and depress it smoothly when the valve is closed until the air bubbles from the hose stop. If the air bubbles stopped going out with the fluid, screw in the drain valve.

Check to be sure that the liquid level in the reverse tank is always above the middle and the hose end is always dipped into the liquid. Only in this case the master cylinder does not suck in the air during priming.

The criterion of full priming is a drastic increase of the pedal force when it is pressed by $L_2=35-40$ mm after selecting free travel.

Accelerated priming of the clutch hydraulic drive is also possible with the external source of compressed air. Follow the steps:

- fill the reverse tank with brake fluid;
- remove the protective valve cap 2 (Fig.31), put the priming hose on the valve, unscrew the valve by 1/2-3/4 revolutions and dip the hose end into the glassy container with the brake fluid;
- put the hose of the external source of compressed air on the cap 2 (Fig.29) of the reserve 1;
- if the air pressure is not higher than 200-250 kPa ($2.0-2.5$ kgf/cm²) make sure there are no air bubbles from the piping.

5.2.1.6 The clutch linkage servicing includes regular inspections of the linkage elements, cleaning and the checks of the following:

- hydraulic and air parts leakproofness;
- reserve tank fluid level and threaded joints tightening.

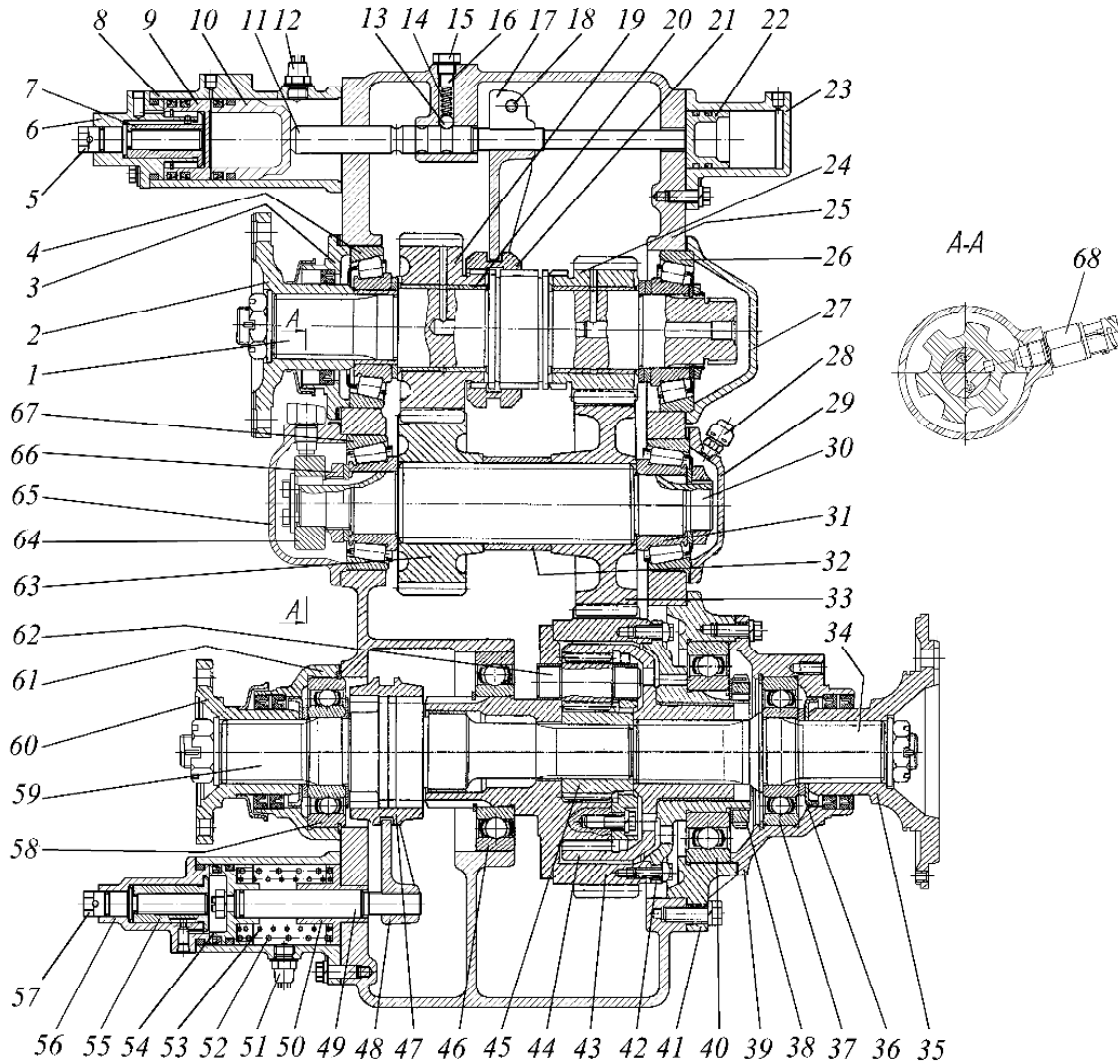
5.2.2 Transfer Gearbox

5.2.2.1 The transfer gearbox (Fig. 32) is mechanic, two-step, with an asymmetrical interaxle differential. The transfer gearbox is located on the truck frame fixed by four rubber pads.

The differential is planetary, with four satellite gears, the sun pinion 45 and the crown gear 44. The sun pinion 45 transfers the torque to the shaft 59 of the front axle drive; the crown gear 44 transfers the torque to the rear axle drive shaft 34.

With the operating (unblocked) differential all the axes are steadily driven and additional loads in the transmission are eliminated. Depending on the road conditions the differential can be switched off (blocked), in this case the front and rear axle drive shafts are rotated as a whole.

The front and rear axle drive shafts have the wiper rings 36. The outer surface of the rings has threaded helical grooves which direct the oil when the shafts rotate in the section between the sleeves and the crankcase. The helical groove has different routes: for the front axle drive shaft it is the left route, for the rear axle drive shaft it is the right route. According to the purpose the wiper rings have the stamped letters «П» (front) and «З» (rear). On assembling the transfer gearbox it is necessary to check that wiper rings are correctly installed, otherwise there will be oil leakage through the sleeve.



1-primary shaft; 2,35,60-flanges; 3,27,29,39,61,65-bearing cap; 4,26,31,67-roller bearing; 5,57-bolts; 6,56-pneumatic cylinder cover; 7,55-bushing; 8-shift mechanism housing; 9-neutral piston; 10, 22,54-pistons; 11,49-rod; 12-low gear indicator switch; 13-ball; 14-spring; 15-plug; 16-pin; 17-gear shifting fork; 18-bolt; 19,63-high gear pinions; 20-bushing; 21-gear shift clutch; 23-cylinder; 24,33-low gear pinions; 25-crankcase; 28-breather; 30-lay-shaft; 32-spacer; 34- rear axle drive shaft; 36-wiper rings; 37,40,46,58-ball bearing; 38,66-bearing nuts; 41-differential rear bearing crankcase; 42-differential cage; 43-differential cage with the lower shaft pinion; 44-crown gear; 45-sun pinion; 47-differential lock coupling; 48-differential lock yoke; 50-piston stop; 51-differential lock indicator switch; 52-outer spring; 53-inner spring; 59-front axle drive shaft; 62-satellite gear; 64-speedometer drive sprocket; 68- pulse generator

Fig. 32 - Transfer Gearbox

When assembling the transfer gear box, it is necessary to ensure the wiper rings correct installation, otherwise oil leakage through the collars is unavoidable.

Transfer gearbox on which the auxiliary PTO with 100 % is installed has an elongated primary shaft and housing changed in the auxiliary take-off area.

5.2.2.2 Transfer gearbox adjustment. Tapered bearings should be adjusted by varying the number of shims under the covers after dismantling the transfer box from the truck. Before adjusting set the box so that the upper inspection hole is positioned horizontally, then take off its cover. Check axial displacement of the shafts using a dial indicator.

5.2.2.2.1 To adjust the main drive shaft bearings:

- check the flange retaining nut torque the torque of less than 200 N.m (20 kgf.m)] and, if necessary, tighten it;

- place the dial gage holder on the flat surface of the crankcase hole, so that its leg rests on the spline face of the main drive shaft middle part;

- using a tire iron as a lever, move the main drive shaft in the pinion until the full stop of the indicator hand, gradually decrease the axial load along the lever length 0.5 m to 2-5 N (0.2-0.5 kgf) and record the indicator readings;

- apply the axial force in the reverse direction and record the second reading of the gage.

The total travel of the indicator hand should be 0.03-0.08 mm. If the value is higher, remove the shim washers from under the front bearing cap.пользуясь монтажной лопаткой.

5.2.2.2.2 To adjust the intermediate shaft bearings:

- remove the intermediate shaft rear bearing cap;

- loosen and tighten the intermediate shaft bearing retaining nut by clamping the spacer of the pinions;

- lock the nut and put the cover back;

- check the axial displacement of the intermediate shaft similar to the procedures with the main drive shaft. In this case the gauge leg should rest on the face of the of the pinions; the total travel of the indicator leg should be 0.03-0.08 mm;

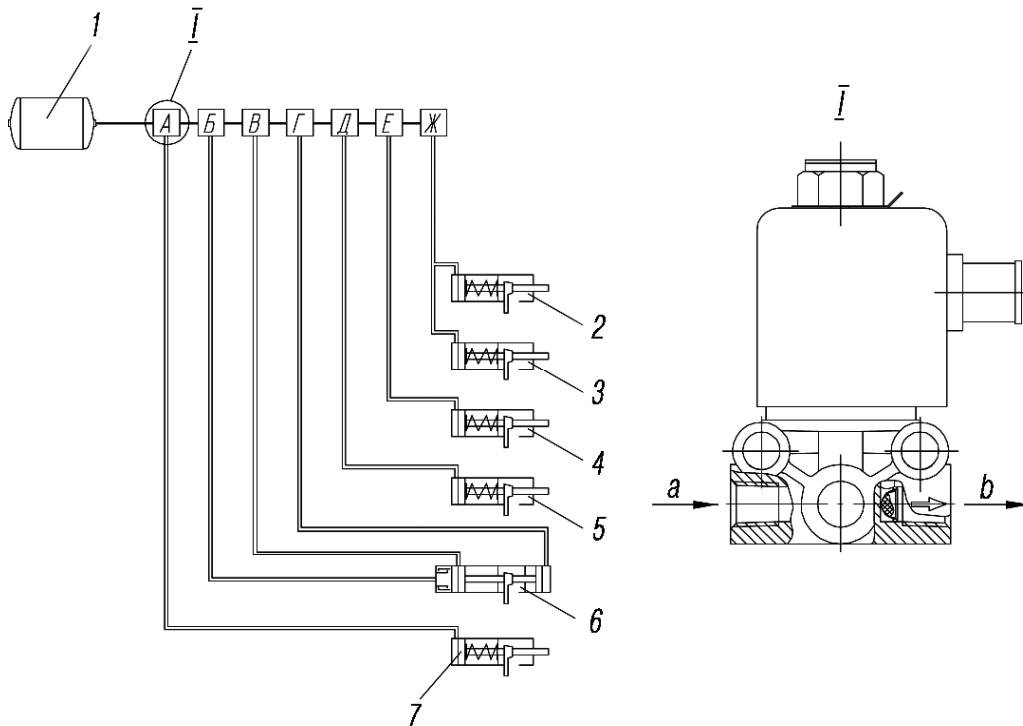
- adjust the bearings by removing the shim washers from under the rear cap of the intermediate shaft. To avoid mistakes during the measurement, check the axial displacement of the shafts before and after the adjustment two or three times. Prior to it, crank the shafts.

Check and, if necessary, adjust the differential lock coupling and the shift collar. Adjust the position of the differential lock coupling 47 by rotating the rod. Checking the position of the coupling set the rod in the front fixed position and crank the front axle drive shaft holding its flange. If it touches the cage, move it forward by rotating the rod clockwise.

In order to check the gear shift clutch 21 position, deliver air under pressure of 0,4-0,6 MPa (4-6 kgf/cm²) to the gear change cylinder via the hole in the cover 6 and cylinder 23 simultaneously, after that define the difference in the splines lengths from both sides of the clutch. The difference in the free lengths of the splines of the primary shaft from both sides of the clutch should be not more than 1 mm. The clutch position should be adjusted by rotating the rod 11, having slackened the bolt 18 fastening the fork 17 and having tightened it after the adjustment. Disregarding the adjustment instructions can cause gears self-disengagement due to the disturbance of locks in the splined part of the shaft.

5.2.2.3 Transmission units control is remote one, electric-pneumatic, consists of the transfer case gearshift mechanism, transfer case differential lock mechanism, auxiliary PTO engagement mechanism *, PTO engagement mechanism *, intermediate and rear axles cross axle differential locks mechanisms, solenoid valves installed on the frame rh sidemember, pipings and switches in the cab.

The transmission units pneumatic control diagram is shown in Fig. 33.



1-non-brake consumers cylinder; 2,3-intermediate and rear axles cross axle differential locks mechanisms; 4- PTO engagement mechanism; 5-auxiliary PTO engagement mechanism; 6-transfer case gearchange mechanism; 7- transfer case differential lock mechanism; activation solenoid valves: A-transfer case differential lock; Б-neutral; В-low gear; Г-high gear; Д-auxiliary PTO*; Е-PTO box*; Ж-cross axle differential lock*; a-air supply; b-to engage

Fig. 33 – Transmission units pneumatic control diagram

In order to engage the transfer case low gear, press the switch on the board in the cabin. When releasing the release button, solenoid valves deactivate, and the gear which is engaged is kept by means of the sprung ball lock 13 (Fig.32).

The neutral is engaged at the simultaneous activation of the solenoid valves «Б» and «В» 33 and moving of the neutral 9 (Fig. 32) till it thrusts against the nave collar 7 and of moving piston 22 till the piston 10 thrusts into the neutral piston 9. The lower gear is engaged when the piston 10 moves till it thrusts against the part 25. The high gear is engaged at the piston 22 travel till the piston 10 thrusts against the neutral piston 9.

* Installed upon request

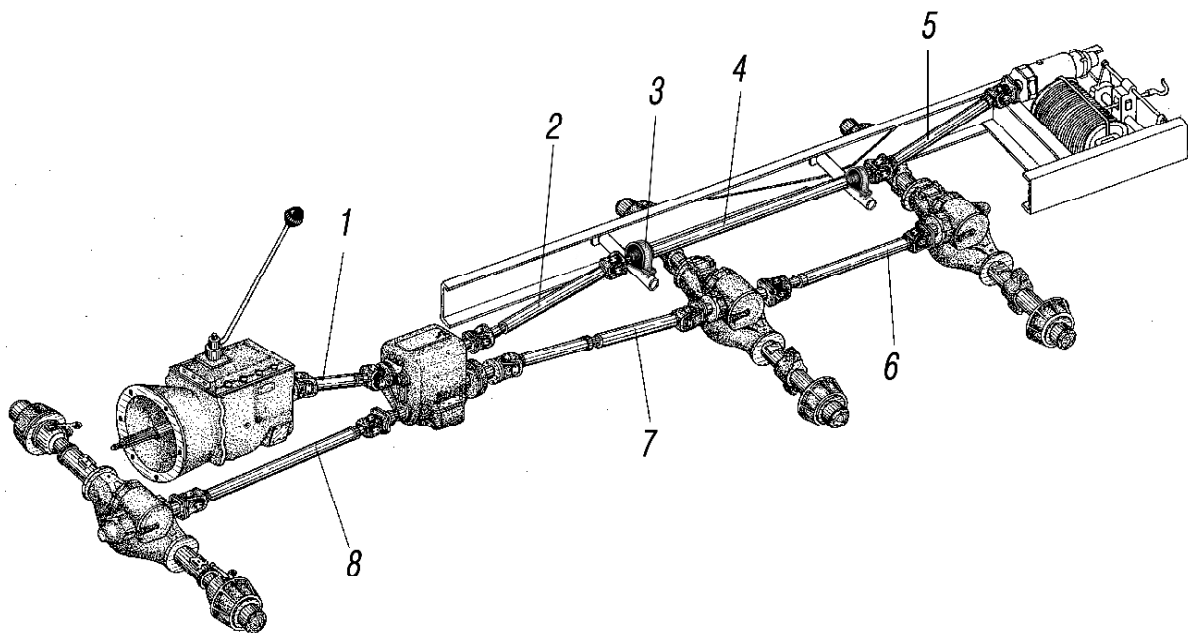
When there is no pressure in the truck pneumatic system, the transfer case gear is engaged which was engaged before, and the differential is unlocked. With the high gear engaged, the neutral and lower gear engagement is done by the bolt 5 rotation counterclockwise. The bushing which is installed in the cover, sets the neutral position of the transfer case through translation movement defined by the intermediate cardan shaft turning over by hand at the gear box control lever neutral position. The low gear engages with further rotation of the bolt. Similarly, during the bolt 57 rotation, the differential gets locked.

During disassembly, all the parts of the electro pneumatic control are to be cleaned from dust and dirt and washed in kerosene. Before assembly, interacting working surfaces of the gear shifting mechanisms, transfer gearbox differential lock, auxiliary PTO and PTO boxes engaging mechanisms, cross-axle differential lock mechanisms are to be lubricated with a thin layer of ЦИАТИМ-201 lubricant, and the collars internal surfaces are to be filled up with the same lubricant. Use sealants AH-8K TY 6-02-6-88, AH-17M TY 6-01-2-728-86 or LOCTITE 577 for all the conical threads; use sealant KJIT-75TM TY 2513-069-00151963-2000 for the sealing gaskets.

In the process of the control system operation and when assembling the system, pay special attention to the pipelines and flexible hoses tightness. The significant leakage location is detected by ear; insignificant leakage is determined by a soapy emulsion. The air leakage is not admissible.

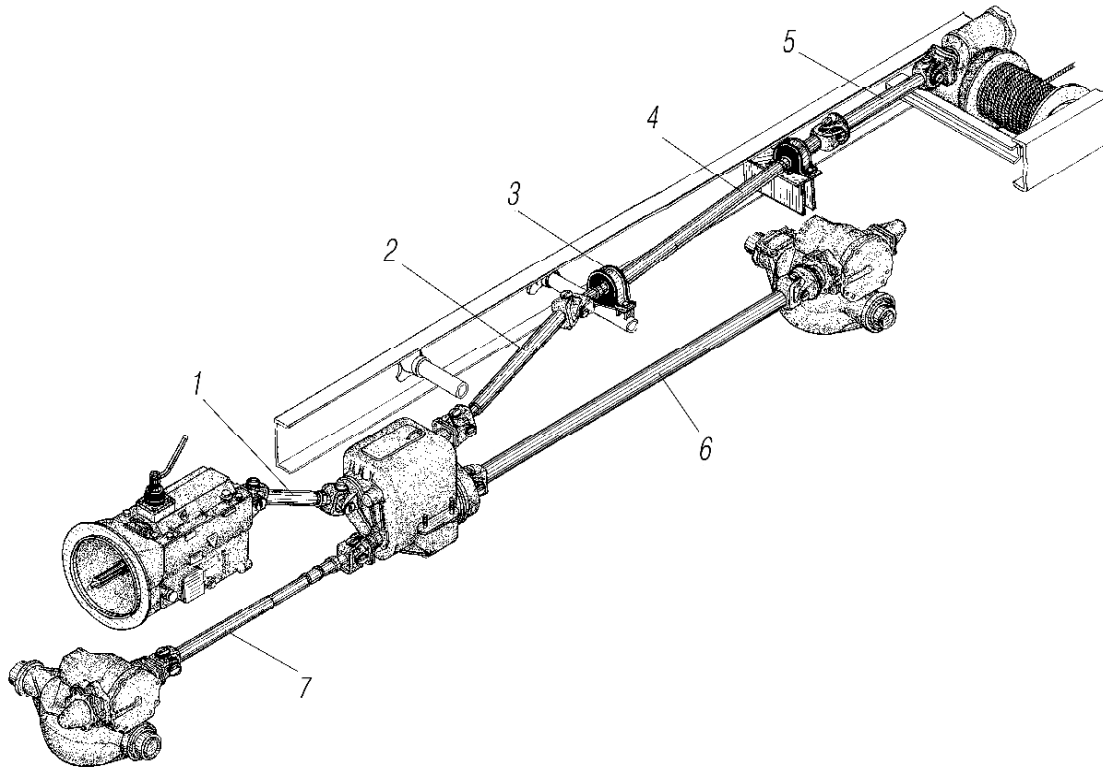
5.2.3. Cardan Drive

5.2.3.1 The torque from the gearbox to the transfer gearbox and the driving axles of the truck is transferred by two propshafts (Fig. 34, 35). The propshafts are open, with complex packing (Fig. 36) of the needle bearings in the hinged joints.



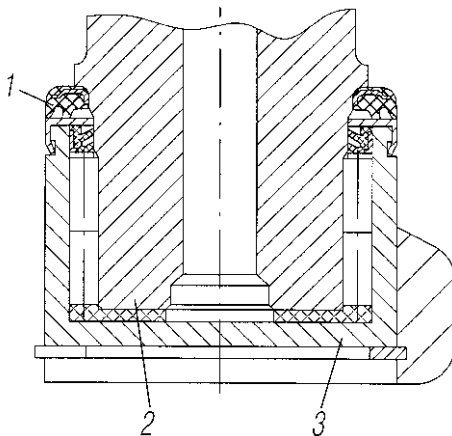
1-intermediate cardan shaft; 2,4,5-winch drive cardan shaft; 3-intermediate support; 6,7,8-axle drive cardan shafts

Fig. 34 – Transmission and winch drive cardan shaft layout
(for 6x6 trucks)



1-intermediate cardan shaft; 2,4,5-winch drive cardan shaft; 3-winch drive intermediate support; 6-rear axle drive cardan shaft; 7-front axle drive cardan shaft

Fig. 35 - Transmission and winch drive cardan shaft layout
(for 4x4 trucks)

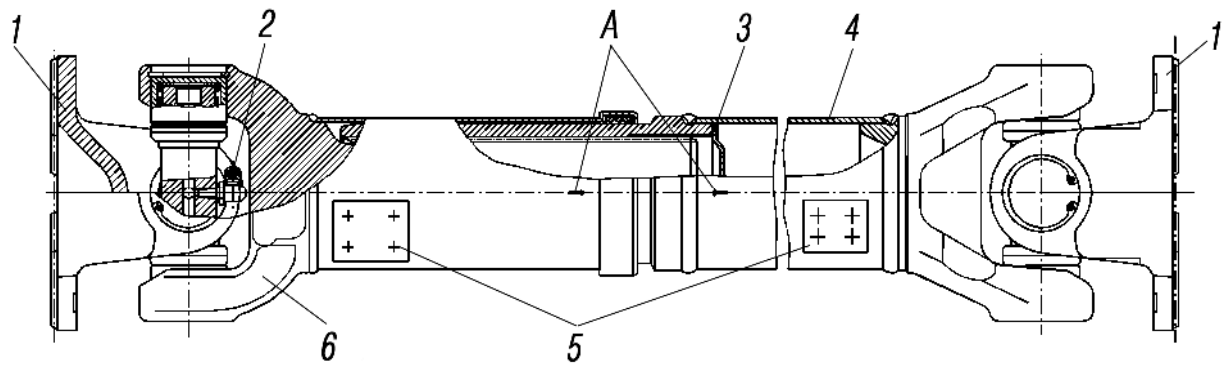


1-face seal; 2-crosspiece; 3-needle bearing

Fig. 36 - Needle bearing integrated seal

When operating the truck:

- check regularly the fastening of the cardan shaft flanges (Fig. 37 and 38);
- should radial clearance exceed 0.25 mm, and end clearances 0.35 mm in the spider bearings, disassemble the cardan joints and replace the spider bearings, if necessary. When disassembling, take care not to damage the packings; replace damaged packings.



1-fork flange; 2-drive-type oil cup; 3-plug; 4-cardan shaft pipe; 5-balancing plate; 6-sliding fork; A-positioning arrows

Fig. 37 - Front and Rear Axle Drive Cardan Shaft

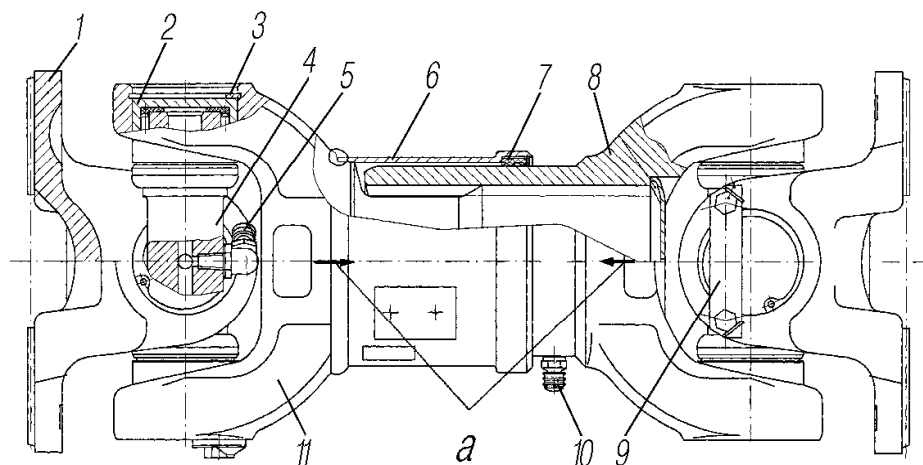
The front and rear axle drive cardan shaft design is shown in Fig. 38.

Before reassembling the joints, pack lubricant between the working edges of the end packing. After reassembling the spiders should turn in the bearings smoothly, without jamming.

Check periodically the clearance in the spline joint. Should the clearance exceed 1.2 mm (front and rear axle drive shafts see in Fig. 37) and 0.55 mm (intermediate shaft and intermediate axle (rear axle for 4x4 trucks) drive shaft), replace the shafts.

When assembling the cardan shaft, see that the arrows stamped on the tube shaft and sliding fork are positioned one opposite another, and the flanges, forks and balancing plates are sealed in the same position they had before disassembling. To provide that, mark the parts of the cardan shaft prior to its disassembling.

Upon replacing the flanges, welded and sliding forks, the cardan shafts should be dynamically balanced repeatedly. The disbalance causes shafts vibration, which effects adversely transmission functioning.

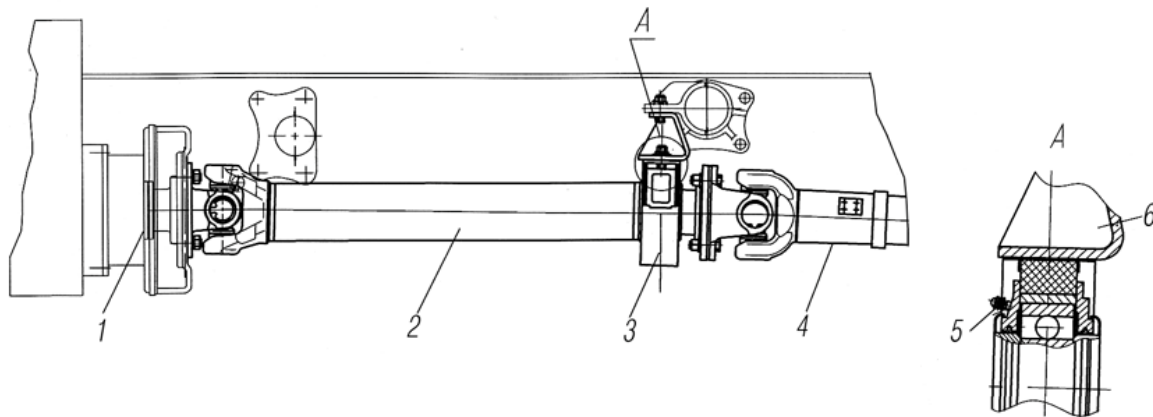


1-flange; 2-needle bearing; 3-tightening plate; 4-spider; 5,10-drive-type oil cup; 6-gasket cover; 7-gasket; 8-spline fork; 9-balancing plate; 11-spline shaft; a - positioning arrows

Fig. 38 - Intermediate Cardan Shaft with end splines

5.2.3.2 Cardan drive of the trucks and special chassis with long base differs from that of the base truck by the modified drive of the intermediate axle, which is a cardan drive consisting of the front shaft 2 (Fig. 39) with intermediate support and a rear cardan shaft 4 with splined connection balanced in set.

The intermediate support bearing is lubricated in accordance with the lubrication chart. The cardan shafts maintenance as per the maintenance procedure approved for the truck.



1-transfer case; 2-cardan drive front shaft; 3-intermediate support; 4-rear cardan shaft; 5-drive-type oil cup; 6-spacer

Fig. 39 - Cardan drive of the trucks and special chassis with long base

5.2.4 Driving Axles

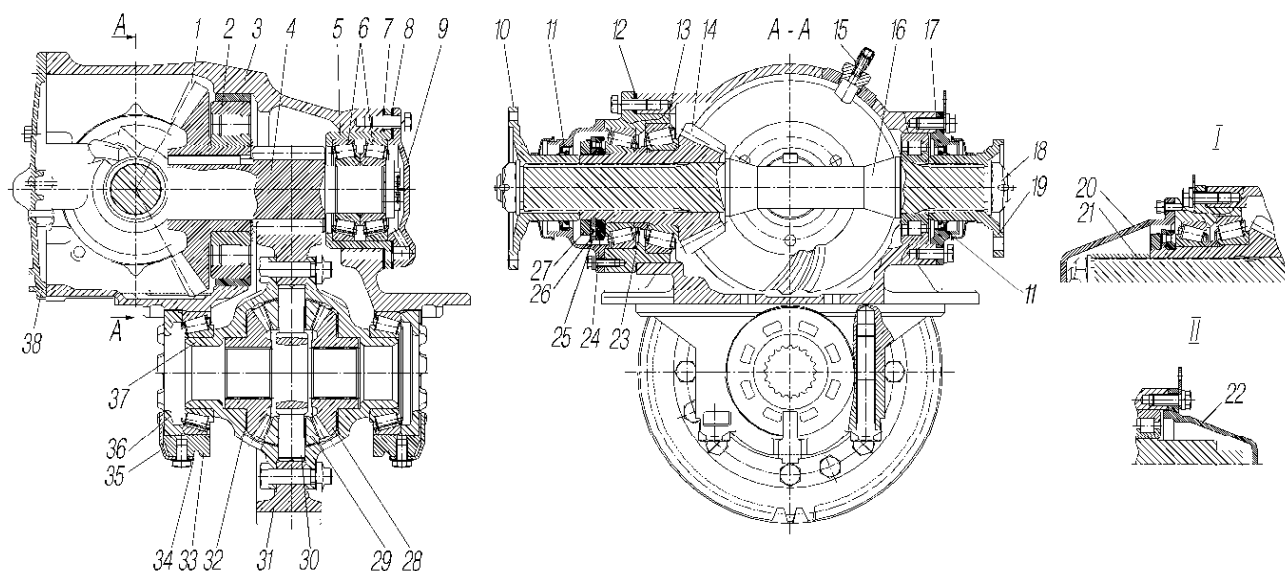
5.2.4.1 The driving axles are drive-through type axles with the upper location of the main gear.

5.2.4.2 Intermediate axle final drive — is of dual type, comprising a couple of spiral-tooth bevel gears 1 and 14 (Fig. 40) and a couple of helical-tooth spur gears 4 and 31. A symmetrical bevel-type differential with four satellites is bolted to the driven spur gear.

The final drives are marked with plates bearing ratio indication, which are placed under the bearing body cap bolt of the driving spur gear. Final drive gears differ by the marks on the driving and driven spur gears (Tabl. 3).

Table 3 - Marks on drive and driven cylindrical pinions

Gear ratio	Marks on the face end of the drive cylindrical pinion on the side of the bevel pinion installation	Marks on the driven cylindrical pinion
6,77	Three bores of $\varnothing 10\text{mm}$ on the neck face $\varnothing 65\text{mm}$ 2 mm deep	Two bores under the pinion crown $\varnothing 5\text{ mm}$ 3mm deep
7,49	No marking	One bore under the pinion crown $\varnothing 5\text{ mm}$ 3 mm deep at the distance of 10 mm from each other



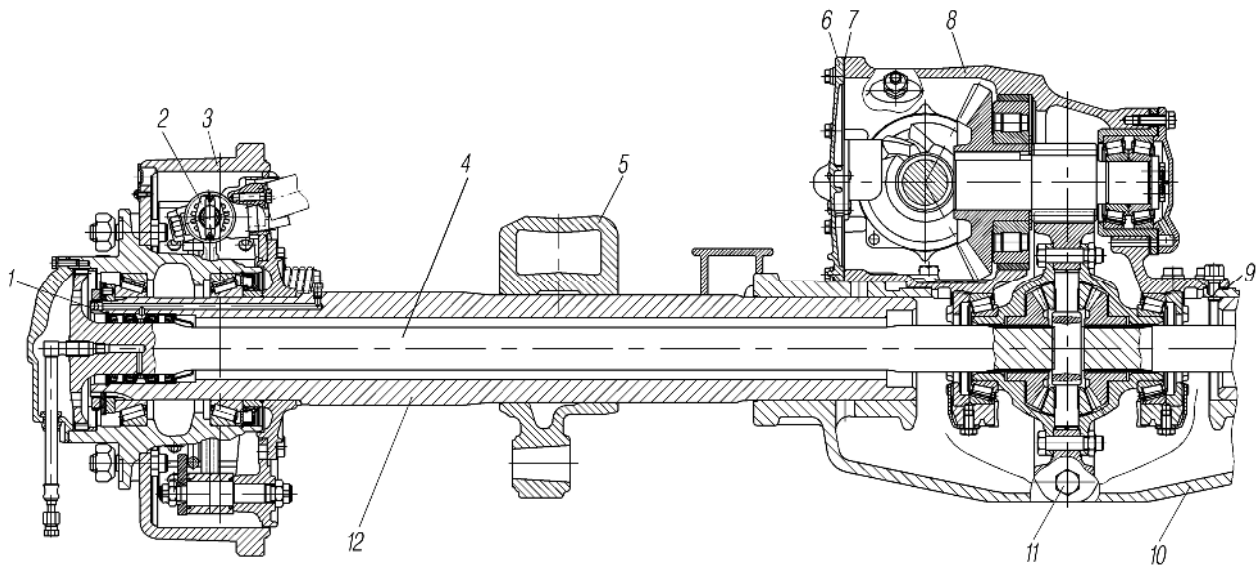
1-driven bevel pinion; 2-cylindrical roller bearing; 3-main gear housing; 4-driving cylindrical bearing; 5-bearing cage; 6-conical roller bearings; 7,8,12-adjusting shims; 9-bearing cage cover; 10-rear axle drive flange; 11-collar; 13-driving conical gear bearing cage; 14-driving conical gear; 15-breather; 16-driving gear shaft; 17-gasket; 18-flange nut; 19-front axle drive flange; 20-front bearing cap; 21-spacing sleeve; 22-rear bearing cap; 23-adjusting washer; 24-nut; 25-lock washer; 26-locking washer; 27-lock nut; 28-half-axle gear; 29-differential satellite; 30-differential spider; 31-driven cylindrical gear; 32-bearing washer; 33-differential bearing cap; 34-lock plate; 35-locking plate; 36-differential bearing adjusting nut; 37-differential carrier; 38-case cover; I-for front axle; II-for rear axle

Fig. 40 – Final drive

The final drive is mounted onto axle case 10 (Fig. 41) via 0.8 mm thick paronite gasket 9, secured thereon with thirteen bolts and two studs.

Eleven bolts and studs are located outside, and two bolts in the bevel gear space. The inner bolts become accessible only after removing side cover 6. Spring washers are fitted under the outer bolts and stud nuts. The inner bolts are cotted with wire.

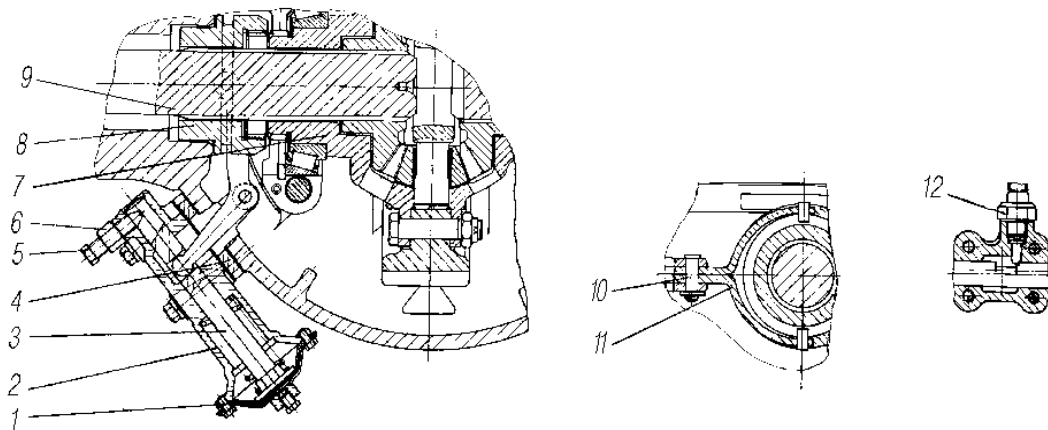
Final drive gears and bearings are lubricated with oil filled into axle case and final drive case up to the inspection hole level. Oil is entrapped by gears, splashed over, gets into bevel gear space of final drive case via roller bearing 2 (see Fig. 40), and then flows down to the axle case. The driving bevel gear bearings are lubricated with oil from bevel gear space, which is supplied to the bearing body via pocket in the case cover and oil supply union.



1-air supply collars; 2-wedge mechanism; 3-brake drum; 4-half-axle; 5-spring supporting bracket; 6-case cover; 7, 9-gaskets; 8-final drive; 10-axle case; 11-drain plug; 12-half-axle casing

Fig. 41 – Rear Driving Axle

5.2.4.3 Intermediate and rear axles. Cross-axle positive-locking differentials* (Fig. 42) are mounted on intermediate and rear axles.



1-диафрагма; 2-корпус механизма включения блокировки; 3-шток; 4-кронштейн; 5-ограничитель; 6-гайка; 7-чашка дифференциала; 8-муфта; 9-полуось; 10-палец; 11-вилка; 12-выключатель

Fig. 42 – Cross-axle Positive-locking Differential of Intermediate and Rear Axles

* On request

Cross-axle differential distributes the torque evenly between axle wheels including cases of driving on rough roads and turns when the wheels rotate with different speed. When driving on hoard-to-pass road sections the truck left side and right side wheels have different tire grip the cross-axle differential can cause the skidding of one of the axle wheels.

Therefore the cross-axle differentials should be locked to increase truck passing ability on such sections. The semi-axes rotate as a whole when the differentials are locked.

Remember that using the locks increases transmission load significantly, therefore use the cross-axle differential lock only at certain conditions as per Section «Truck Driving» taking into account restrictions contained in the Section «Warnings».

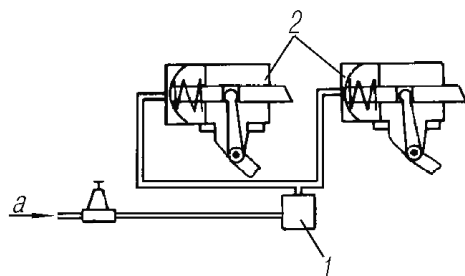
Differential is locked by splined ring on the carrier 7 left end face and splined coupling 8 on the splines of left semi-axle 9.

Cross-axle differential lock of intermediate and rear axles has an electronic pneumatic drive.

Press the switch 28 «» (Fig.19) on the dashboard to lock intermediate and rear axles differential from the cab. By that the air is delivered under pressure to the pneumatic cells of locking mechanisms 2 and moves rod 3 by acting on diaphragm 1 (Fig.42).

Rod moves coupling by fork 11. The coupling is moved along the splines of the semi-axle and engaged with the splines on projected neck of the carrier.

The Scheme of Pneumatic Control of Cross-axle Differential Lock is shown in Fig. 43.



1-solenoid valve of intermediate and rear axles cross-axle differentials lock; 2-locking mechanisms of cross-axle differentials of intermediate and rear axles; a- from the reservoir

Fig. 43 – Scheme of Pneumatic Control of Cross-axle Differential Lock

The rod acts on the switch 12 mounted in the housing of cross-axle differential lock of intermediate and rear axles; due to this the indicators 1 and 3 (Fig. 42) on the dashboard light up.

By closing the activating valve the pneumatic cells are connected to the atmosphere, the air goes out, mechanism returns to the initial position by the action of the spring and the indicators lamps dye out.

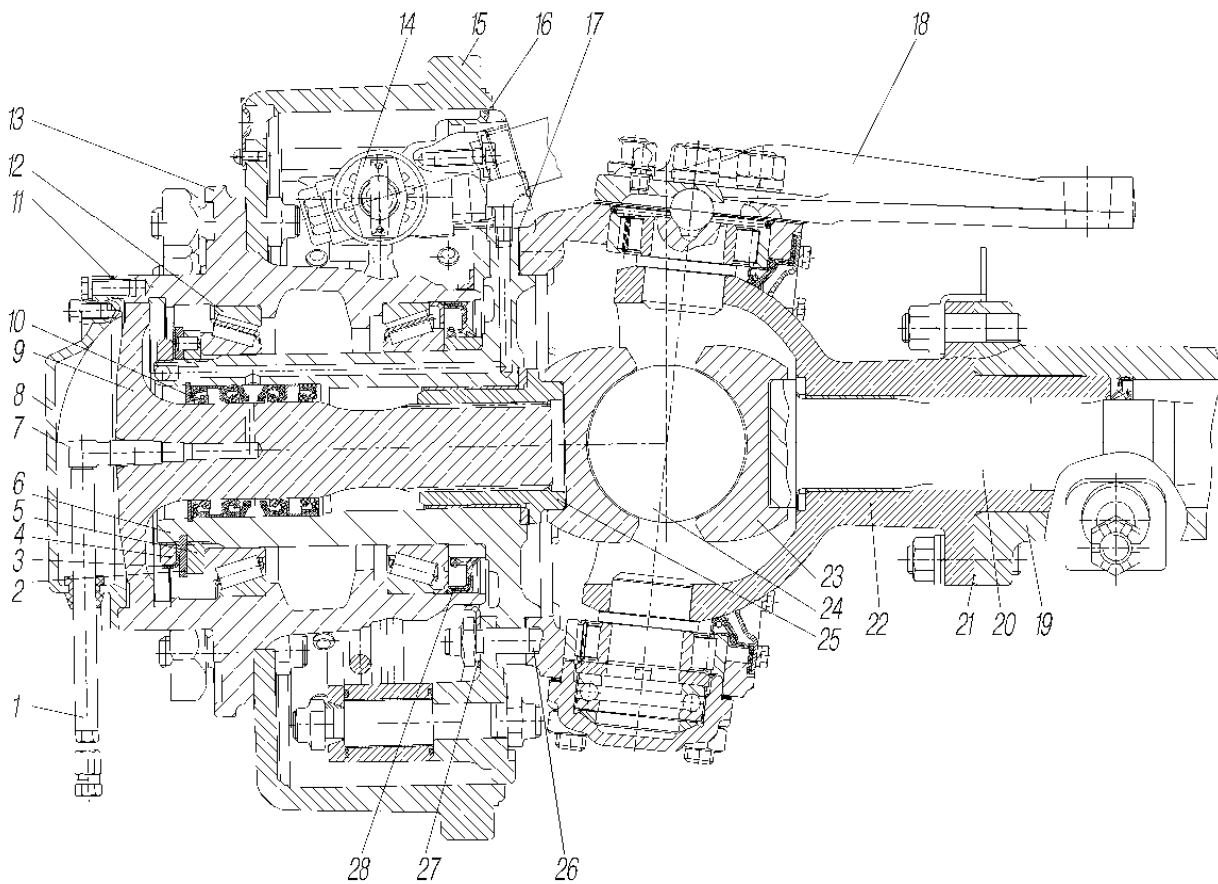
The locking mechanism is to be readjusted after repair works with disassembling and replacing of its parts. Adjust the mechanism as follows: hoist the axle, brake one brake drum and lock the semi-axle with differential carrier by letting the air to the air chamber while rotating the other brake drum.

Screw in the rod motion limiter 5 up to contact to rod end face, lock the differential, screw the limiter by one more revolution and lock it with the nut 6 by 49,0-60,8 N.m (5,0-6,2 kgf.m).

5.2.4.3 Front axle final drive differs from that of the rear axle by the drive flange. Spacing sleeve 21 (Fig.40) with cap 22 is fitted on the front end of the front axle driving gear shaft, flange 21 on the rear end. Rear axle final drive has a flange at the driving bevel gear side. Splines may be unavailable on the opposite end of the driving gear shaft.

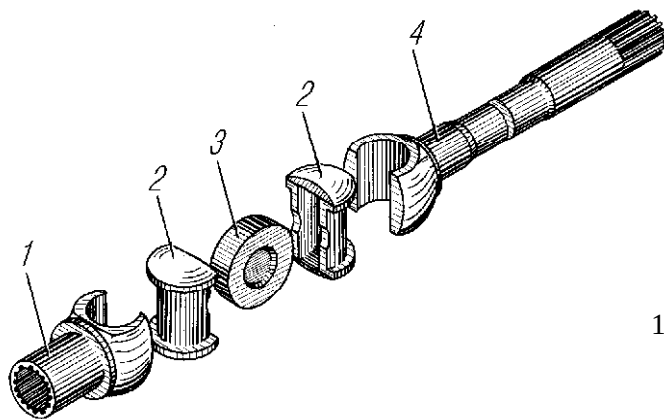
Axle cases 10 (see Fig. 41) are combined of cast middle part and tubular half-axle casings pressed therein. The half-axes are full floating, splined with the hub.

5.2.4.4 Front axle is a driving, steerable unit. Design of the front driving axle steering knuckle unit is shown in Fig. 44. Torque is transferred to the front driving wheels via half-axes and hinges with equal angular velocity (Fig. 45).



1-air supply hose; 2-lock washer; 3-retaining ring; 4-lock nut; 5-wheel bearing nut; 6-journal; 7-air supply elbow; 8-wheel hub cover; 9-outer half-axle; 10-collars unit; 11,17, 21-gaskets; 12-bearing; 13-hub; 14-wedge mechanism; 15-brake drum; 16-brake support; 18-steering knuckle lever; 19-half-axle casing; 20-inner half-axle; 22-ball support; 23-hinge knuckle; 24-hinge disc; 25-outer half-axle fork; 26-stud; 27-baffle; 28-collar

Fig. 44 – Drive to steerable wheels of the front driving axles



1-fork; 2-knuckle; 3-disc; 4-inner half-axle

Fig. 45 - Equal Angular Velocity Hinge

For ensuring reliable and long-life operation of the driving axles, use oils in accordance with the lubrication chart and maintain the required oil level in the cases. To replace the lubricant in half-axle hinges of the front axle, dismantle the wheel, brake drum in assy with the hub, brake shield and slewing journal. Remove lubricant and wash the parts of the hinges with equal angular velocity.

When it is necessary to disassemble the ball bearing out of the front axle housing, puller bolts from the big tool bag should be used. For this, install them into the threaded holes of the flange of the ball bearing; screwing them uniformly, disengage the ball bearing tail from the half-axle housing.

Check regularly the tightness of the bolts fastening the final drive to the axle case. Slackening of the bolts causes case bending.

When adjusting the final drive, adjust the taper bearing preload and check the contact pattern in the final drive bevel gearing. For adjustment remove the final drive from the truck. Check the preload by the torque required for cranking the shaft. Determine resistance torque by means of a dynamometer.

Measure the torque smoothly rotating the shaft in one sense after at least five full revolutions. Remember, maladjustment of bearings can cause damage not only of the bearings, but also of the final drive gears.

5.2.4.5 When adjusting the bearings, follow the procedure:

1. Fit the final drive in the fixture, remove the differential and flanges. Unscrew the bolts fastening the driving bevel gear bearing body. Take out the driving gear shaft together with bearing body and gear.

Clamp the driving gear in the vice by its gear rim. Unscrew the bolts fastening the cover and remove the latter. Unlock the lock nut and unscrew it. Remove the lock washers. Tighten up the nut with a torque 450-500 N.m (45-50 kgf.m).

Do not readjust the body bearings if no clearance is sensed after tightening up the nut.

Estimate thickness reduction of adjusting washer 23 (see Fig. 40) (runout value plus 0.03-0.05 mm preload). Unscrew the nut, remove the bearing and adjusting washer. Grind or select the washer to meet the required size, fit the washer and reassemble the bearing unit of the driving bevel gear. Torque for tightening the nuts is 450-500 N.m (45-50 kgf.m). Lock the lock

nut by bending out one washer edge. Torque required for cranking the driving bevel gear in the bearings should be 0.6-1.4 N.m (0.06-0.14 kgf.m). Force on the dynamometer, when uncoiling the cord from the body surface, is 7.5-17.5 N.m (0.75-1.75 kgf.m) (Fig. 46).

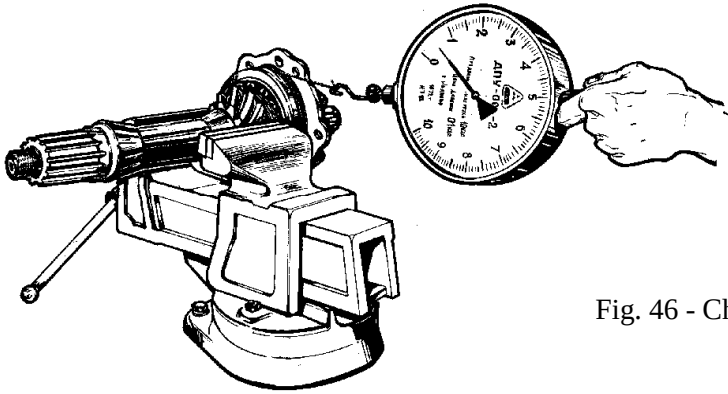


Fig. 46 - Checking Adjustment of Driving Bevel Gear Bearings

2. Adjust preload of the intermediate shaft bearings. Adjust the bearings by selecting a pack of shims 8 (see Fig. 40) to be placed under cap 9 of body 5. The torque required for cranking through the intermediate shaft should be within 0.9-1.5 N.m (0.09-0.15 kgf.m).

When using the dynamometer for measuring the torque, coil the cord on the spur gear rim; the dynamometer readings should lie within 18,3-30,5 N (1,83-3,05 kgf). Remember, that when shims are removed from under the body cap, when adjusting the bearings, the driven bevel gear is shifted towards reduction of the backlash; therefore, add shims under bearing body 5 to maintain the backlash.

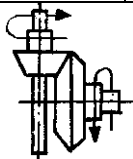
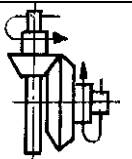
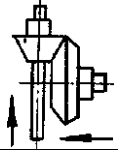
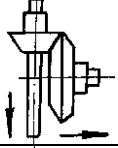
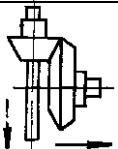
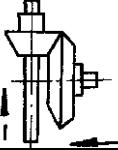
3. Mount the body with the driving bevel gear into the final drive case. Torque the body fastening bolts to 60-80 N.m (6-8 kgf.m). Check the correct meshing of the bevel gears using the paint contact pattern. The pattern length is 60 % minimum, for the tooth length (Table 4).

The pattern should be offset by 5 mm minimum, from the tooth narrow end, the backlash (at the tooth root) being within 0.1-0.4 mm. For changing the backlash in the bevel gears without disturbing the contact, shift both gears to a distance, which is proportional to the number of teeth of each gear, i.e. shift the driven bevel gear 2.2 times (24:11) farther than the driving one.

4. Mount the differential and adjust the differential bearings. Tighten the bolts fastening the differential bearing caps to 250-320 N.m (25-32 kgf.m). Adjust the differential bearing caps using nuts 36 (see Fig. 40). Upon tightening the nuts the distance between the differential bearing caps should increase by 0.04-0.14 mm. When adjusting, turn the differential through for self-adjusting of rollers in the bearings. The driven spur gear rim should be positioned symmetrically about the driving gear rim.

Due to the enhanced production technology of differential pinions the satellite side gear tooth shape has been altered. The altered pinions are not interchangeable with the previously manufactured ones and should be replaced as a whole. There are marks to differentiate the pinions: the axle shaft gear has a groove of 90 mm in diameter and the satellite gear has a step-shaped face end.

Table 4 - Adjusting the Engagement of the Bevel Pinions of the Main Gear

Bearing pattern position on the driven bevel pinion tooth		Methods to set the correct engagement of the bevel pinions	Direction of the bevel pinions
Forward travel	Backward travel		
			
		Correct gear contact	
		Shift the driven pinion closer to the drive pinion. If the side clearance between the teeth is too small in this case, shift the drive pinion away	
		Shift the driven pinion away from the drive pinion. If the side clearance between the teeth is too large in this case, shift the drive pinion	
		Shift the drive pinion closer to the driven pinion. If the side clearance between the teeth is too small in this case, shift the drive pinion away	
		Shift the drive pinion away from the driven pinion. If the side clearance between the teeth is too large in this case, shift the drive pinion closer	

Adjust the steering axle kingpin bearings during the sixth maintenance works TO- 15 000 (at 96,000 km). Follow the steps:

- dismount the wheels and put the supports under the bottom caps of the steering knuckles;
- dismount the left steering knuckle lever and the upper cap of the right steering knuckle;
- remove two gaskets from the gasket pack under the lever and the cap: one gasket of 0.05 mm thick, the other-0.1 mm thick; put 50 g of Litol-24 lubricant GOST 21150-87 to the lever cavity and put the lever and the cap back in their place; tighten the nuts with the torque 160-200 N.m (16-20 kgf.m);
- put the supports away and remove the lower caps;
- remove the gasket pack 0.15 mm from under each cap [(0.05+0.1) mm];
- place the caps back and tighten the nuts with the torque 160-200 N.m (16-20 kgf.m);
- mount the wheels.

Wheel hub bearings adjustment:

- jack up the axle on the side of the wheel which is being adjusted;
- remove the hub cap;
- using a wheel puller disengages the axle shaft gear and the hub, pull the semi-axle out;
- unscrew the outer nut and remove the retaining and the locking washers;

- rotating the wheel manually, make sure there is no friction between the brake drum and the brake shoe;

- tighten the nut with the torque 300-350 N.m (30-35 kgf.m). During the process turn the hub until the rollers set in the bearings. Afterwards, loosen the nut by 1/5-1/6 revolutions. Fix the locking washer.

If the nut hole does not align with the locking washer hole, loosen the tightening of the nut by the value which does not exceed the space between two adjacent holes. Fix the retaining washer, tighten the locknut with the torque 400-500 N.m (40-50 kgf.m), and lock it.

To connect the wheel pumping hose with the wheel valve, set the semi-axle with the hub in a way that the hose is located opposite the wheel valve symmetrical to the wheel studs.

After mounting the wheels, check the wheel bearing adjustment during the haulage of 10-20 km. If they were adjusted properly, the hub should be cold or slightly warm. If it is significantly hot, check the bearing adjustment 10-20 km.

5.3 Running gear

5.3.1 Frame

The truck frame is a riveted structure consisting of two stamped variable-section side-members interconnected by six cross-members and a bumper in front.

Frame servicing lies in inspection of bolted and riveted connections. See that frame configuration and strength of its elements are not impaired. If the rivets are loose, cut them off and replace by the new ones. It is allowed to replace loose or cut off rivets by bolted connections using the 8.8 bolts and nuts with lock nut.

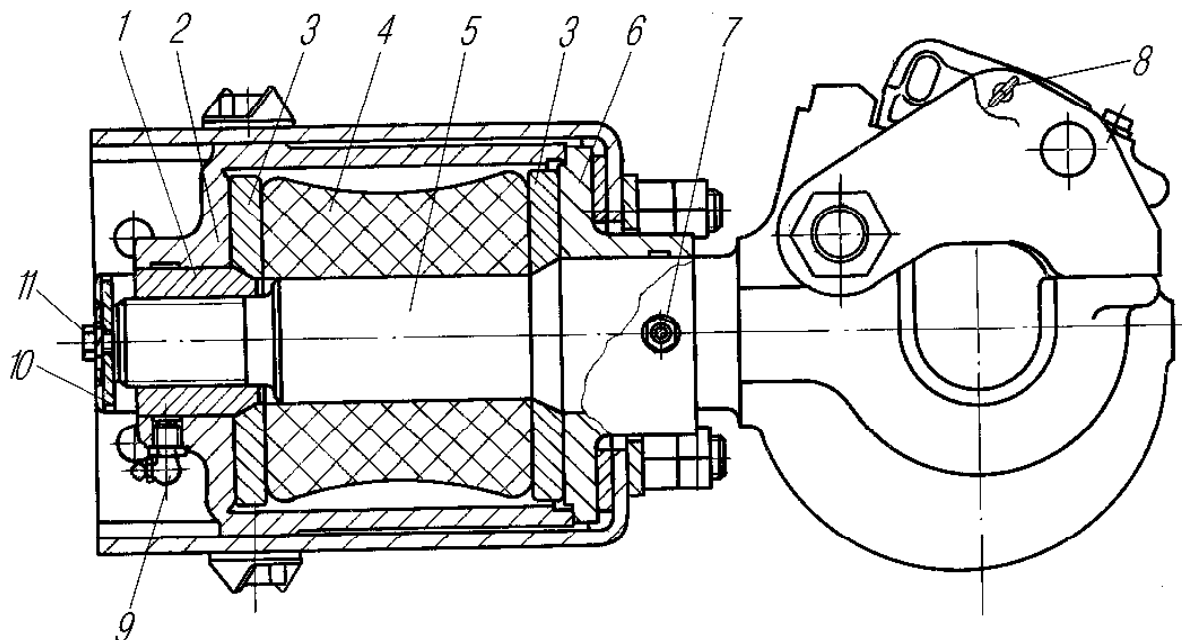
5.3.1.1. Towing unit in accordance with GOST P 41.55-2005 product class C50-5 (see the installation and operation instructions «Towing Unit 21-202»)

5.3.1.2. The «hook-loop» type towing device (according to GOST 2349).

On the customer request, it is technically feasible to install the «hook-loop» type towing device (supplied as spare parts for Ural trucks) for operation with trailers as per GOST 2349-75 dimension type 3. The coupling hook general dimensions should correspond to GOST 2349-75 for the dimension type 3.

The towing unit is secured in a special towing cross-member.

Rod guides of the towing hook are greased by means of lubricators, when servicing the truck. The hook should be turned freely by hand in the support of housing 2 (Fig.47) and in bushing 6.



1-nut; 2-housing; 3-pressure rings; 4-elastic element; 5-towing hook; 6-guide bushing; 7,9-grease nipples; 8-locking cotter pin; 10-retaining strip; 11-bolt

Fig. 47 - «Hook-Loop» Type Towing Device

Towing device servicing includes cleaning and lubricating. Lubricate the drawnhook stem guides through oil fillers during vehicle maintenance operations.

Axial displacement of the hook in the housing should not exceed 0.5 mm. To ensure it tighten nut 1 until a clearance is formed between housing 2 and pressure ring 3 due to elastic element's 4 deformation (to be determined by free displacement of the towing hook). Then, unscrew the nut until eliminating axial displacement of the hook and lock it with retaining strip and bolt. Retaining strip 10 together with bolt 11 turned into its hole and the hook rod may move within amount of clearances in the connection элемента 4.

Fit locking cotter pin 8 when operating the truck with trailer.

Truck operation with trailer without the retaining strip 10 and with unsecured latch of the towing hook by the locking cotter pin 8 is not admissible.

When operating the truck with the trailer check the wear of hook (jaw) working surface. Allowable limit wear of the jaw should be $\varnothing 58$ mm max ($\varnothing 48+1,9$ mm for the new towing hook). It is prohibited to tow the trailer having the towing loop with working area section of 43.9 mm.

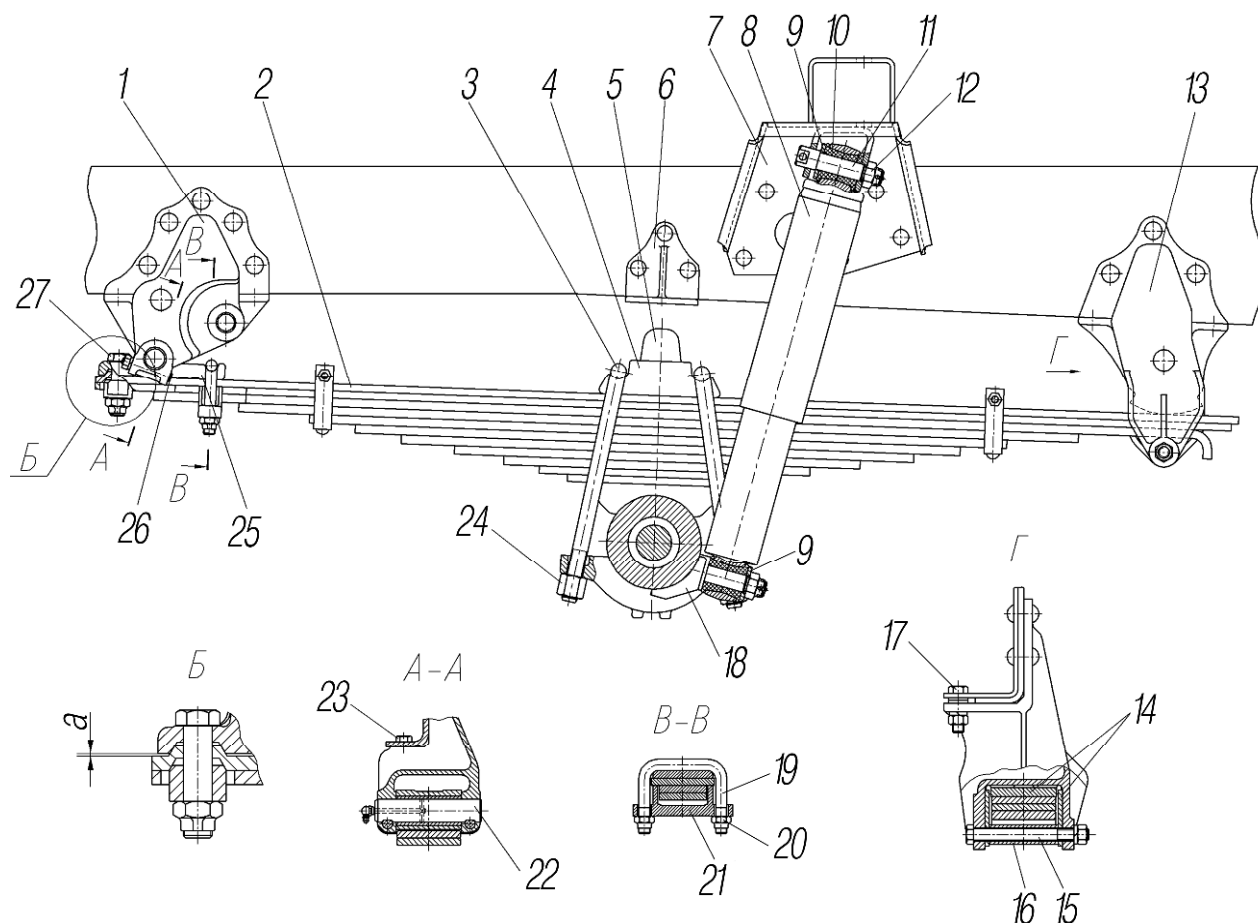
5.3.2 Truck Suspension

5.3.2.1 The truck front suspension (Fig.48) consists of two longitudinal parabolic springs 2 that work jointly with hydraulic telescopic bilateral shock absorbers 8. Upper shock absorbers eyes are attached to brackets 7 (attached to the frame girders) through rubber sleeve pipes 10. Lower shock absorbers eyes are attached to brackets 18 welded to the axle beam.

Springs are fixed in the middle part on the axle beam with U-bolts 3 on the axle housing. The axle upstroke is limited by the rubber bump stops 5 fixed in the spring lining 4. The axle downstroke is limited by the third deflected spring plate ends with the drawbar fixture screws 15 of the rear spring plates supporting brackets which have the spacers 16.

Eyes 25 are secured onto the spring front ends by means of U-bolts 19 and bolts 27. Through the eye the springs are connected with front brackets 1 by pins 22, which are locked in the brackets by wedges 26. The spring rear ends enter freely the eyes of rear brackets 8.

Depending on the front axle load of the truck there can be used the front springs which blades differ in their thickness; in this case the front spring U-bolts and other fixture parts are not changed.

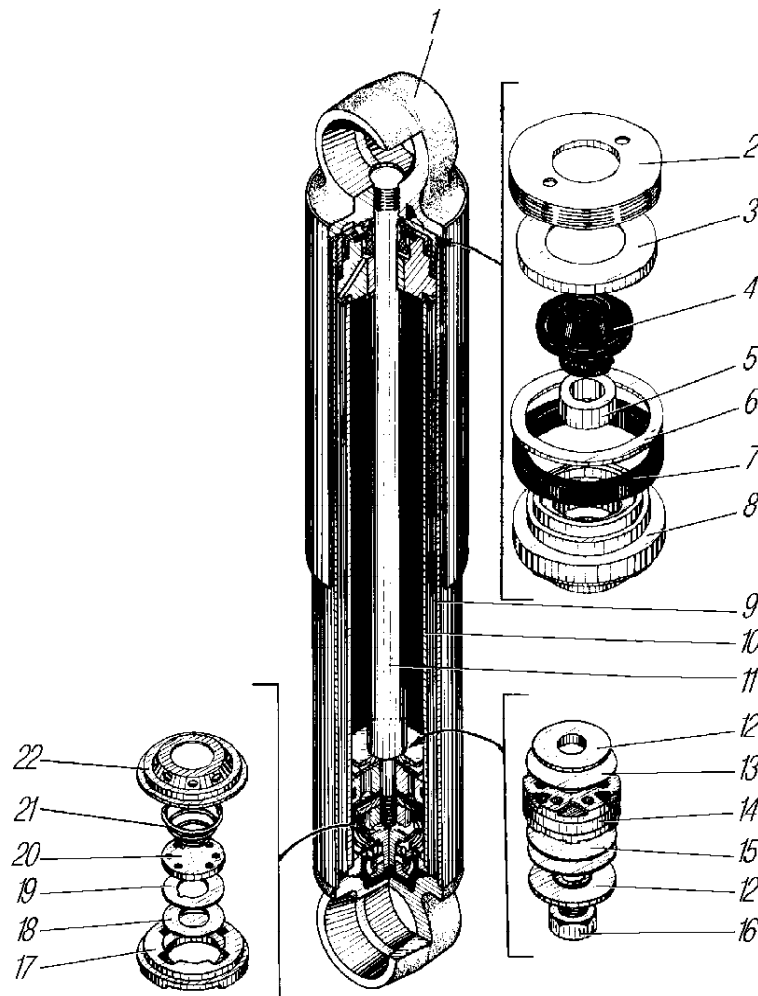


1,13-spring bracket (front, rear); 2-spring; 3-spring U-bolt; 4-spring stiffening plate; 5-bump stop collars; 6-bump stop collar bracket; 7,18-snubber supporting brackets (top and bottom); 8-snubber; 9-washer; 10-snubber bushings; 11-snubber pin; 12-fastening nut; 14-inserts (top and side); 15-brackets coupling bolt; 16-spacer; 17-bolt fastening the rear bracket to the amplifier; 19-eye U-bolt; 20- U-bolt nut; 21-eye stiffening plate; 22-spring eye pin; 23-bolt fastening the sidemember flange; 24-U-bolt nut; 25-spring eye; 26-wedge; 27-eye fixture screw; $a = 1-2,5 \text{ mm}$

Fig. 48 - Front Suspension

5.3.2.2 The hydraulic shock absorbers (Fig. 49) dampen oscillations which arise in the course of elastic strain on the suspension parts when the truck is being driven on a bumpy road. The hydraulic snubbers function as follows: during relative displacements of the sprung and unsprung parts of the truck, the liquid in the snubber flows from one cavity into the other through the small holes, resists the vertical shift of the rod and dampens the truck oscillations.

Using the snubbers extends the springs operation time and improve the truck stability and response. The snubbers stroke is 300 mm.



1-upper head; 2-body nut; 3-washer; 4-rod gland; 5-body bushing; 6-washer; 7-packing ring; 8-gland housing; 9-shock absorber body; 10-cylinder; 11-piston rod; 12-limiting plates; 13, 15, 18-valve disks; 14-piston; 16-piston nut; 17-valve cage; 19-throttle compression disc; 20-pressure disk; 21-springs; 22-cover

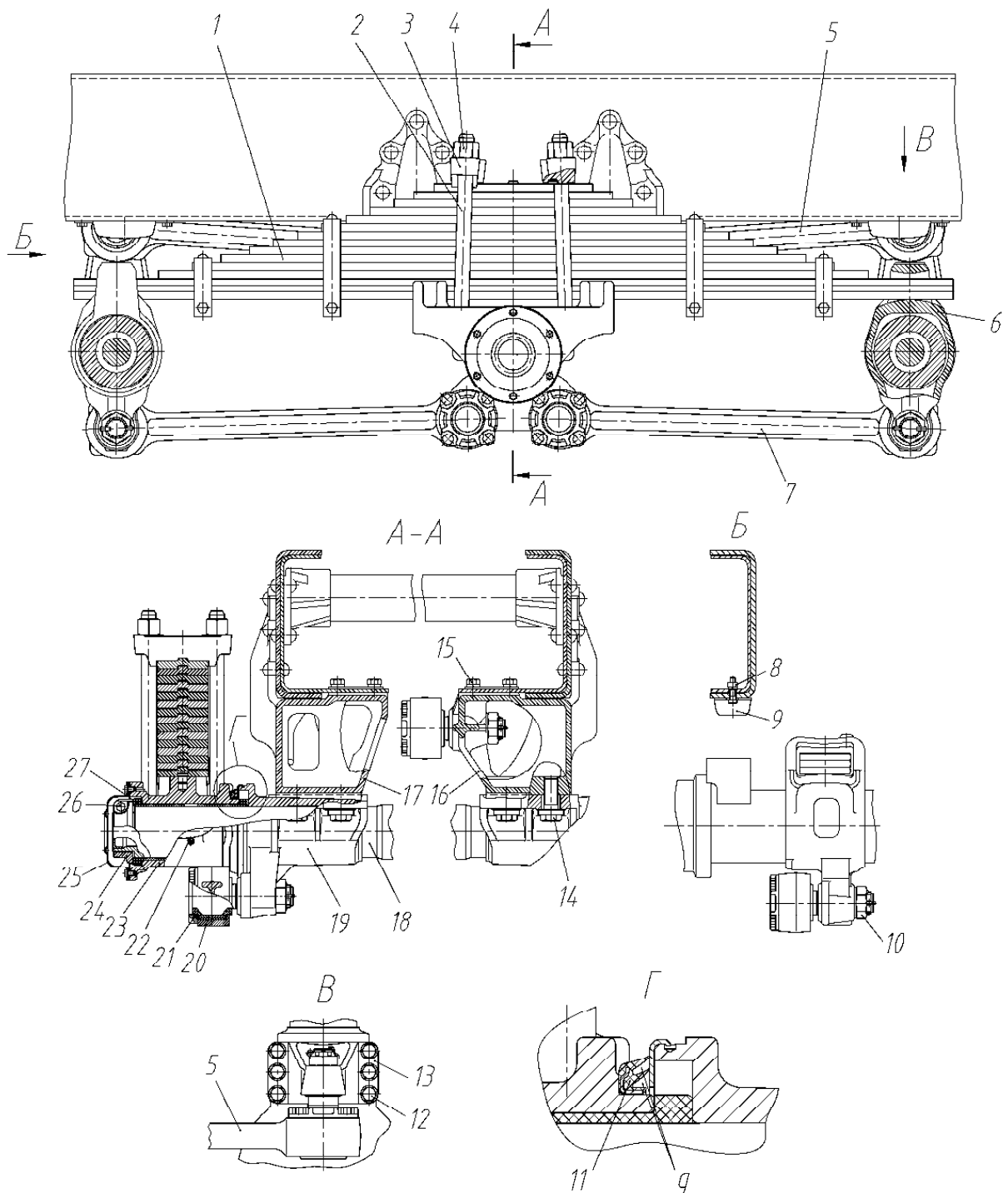
Fig. 49 – Shock Absorber (manufactured by BAAZ)

5.3.2.3 6x6 Trucks Rear Suspension – is fully articulated. The spring ends enter the eyes of supporting brackets 6 (Fig. 50). The springs are secured by U-bolts 2 to beams 23, which rock on walking-beam axle 18. Onto the axle are pressed brackets 19, through them axle 18 is secured to walking-beam brackets 16 and 17 by bolts 14. Pushing and braking forces are transferred from the axles to the truck frame via two upper torque rods 5 and four lower ones 7. Side forces are transferred via the springs

The torque rod 20 joints are rubber-metal ones. The pins with shortened taper fitted in the upper torque rods at the side of truck axles are held against turning through in the brackets by means of Woodruff keys. The torque rod head is sealed by the gasket fitted under the cover at one side, and at the other side, by packing ring 21.

The axles upward travel is limited by the rubber bumper 9 thrust, mounted on the sidemember lower flange. The axle's move down is limited by jamming the spring end in supporting bracket 6.

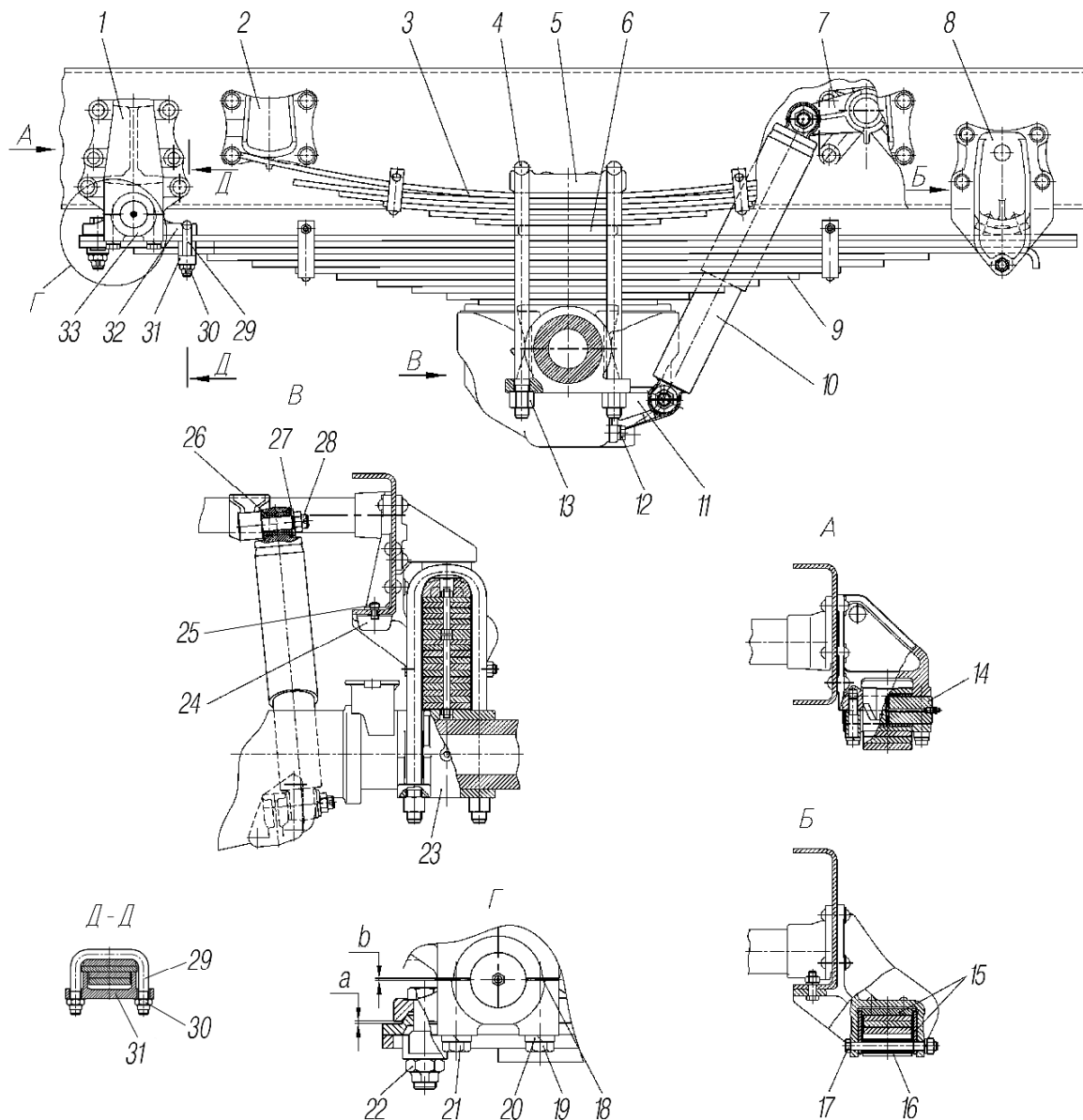
The truck suspension with various rear bogie loading differs in spring and U-bolt length.



1-spring; 2-U-bolt; 3-spring pad; 4-u-bolt nut; 5,7-torque rods (upper and lower); 6-spring supporting bracket; 8-buffer bracket nut; 9-buffer; 10-torque rod pin nut; 11-guard ring; 12-bolt fastening the upper jet thrust bracket to the axle housing; 13-upper jet thrust bracket; 14-walking-beam axle fastening bolt; 15-bolts fastening walking-beam bracket to the stiffener; 16,17-walking-beam bracket (rh, lh); 18-walking beam suspension axle; 19-axle arm; 20-metal rubber joint; 21-torque rod head cover; 22-lubricator; 23-walking beam; 24-walking beam fastening nut; 25-walking beam cap; 26- walking-beam fastening nut coupling bolt; 27-walking-beam bush; g-cavities under the guard ring edges

Fig. 50 – 6x6 Truck Rear Suspension

5.3.2.4 4x4 Truck Rear Suspension consists of two main springs 9 and two additional springs 3 (Fig. 51). Fastening the eye to the spring leaves and fastening the spring to the frame of the front and rear suspensions are similar. As opposed to the front spring, on the rear spring the pin 14 is fastened by removable covers 33. The axle movement upwards is limited by buffer 24 mounted on the sidemember lower flange. The axle movement downwards is limited by engaging the bent end of the spring third leaf by spacers 16 put on the bolts 17. The rear suspension shock absorbers are similar to the front suspension shock absorbers.



1,8-spring brackets (front, rear); 2-additional spring bracket; 3-additional spring; 4-spring U-bolt; 5-pad; 6-lining; 7,11-shock absorber brackets (upper and lower); 9-spring; 10-shock absorber; 12-shock absorber bracket bolt; 13-U-bolt nut; 14-pin; 15-inserts (upper and side); 16-spacer; 17-bracket coupling bolt; 18-shim; 19,21-bolts; 20-spring washer; 22-spring eye bolt nut; 23-spring supporting bracket; 24-buffer; 25-buffer fastening nut; 26-shock absorber bushings; 27-washer; 28-shock absorber fastening nut; 29-eye U-bolt; 30-eye U-bolt nut; 31-eye pad; 32-eye; 33-front bracket cover; $a = 1-2,5 \text{ mm}$; $b = 1-2 \text{ mm}$

Fig. 51 – 4x4 trucks rear suspension

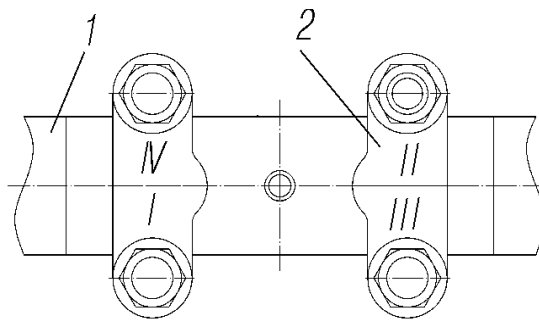
5.3.2.5 Maintenance includes lubrication of the parts and assembly units, checking and adjusting their fastening. Suspension bolted connections' slacking is not allowed.

For preventing shearing of the centre bolt in the front spring and centering protrusion on the rear spring, as well as to avoid untimely breakage of the front and rear springs, tighten the U-bolt nuts in due time of the 6x6 and 4x4 truck front spring and 4x4 truck rear spring on loaded truck and tighten 6x6 trucks rear springs U-bolt nuts on unloaded truck. When squeaking is sensed in the springs, jack up the truck against its frame and pack grease into the gaps formed between the leaves. Once disassembling the spring, lubricate the leaves after removing the aged grease, soil, and rust. Wash and lubricate the eyes and pins of the springs.

When assembling lubricate the front and rear springs U-bolts thread with graphite grease or lubricant of ТСгип type.

Tighten the U-bolts nuts as shown in fig. 52:

- front springs (on loaded truck): first with a torque of 200-250 N·m (20-25 kgf·m) and finally to 400-500 N·m (40-50 kgf·m);
- 6x6 trucks rear springs (on unloaded truck) and 4x4 truck (on loaded truck): first with a torque of 250-300 N·m (25-30 kgf·m) and finally to 580-660 N·m (58-66 kgf·m).



1-spring; 2-6x6 truck rear spring stiffening plate (6x6, 4x4 trucks front axle beam clamp, 4x4 truck rear axle beam bracket); I-IV-order of U-bolts nuts tightening

Fig. 52 - Springs U-bolts Nuts Tightening Scheme

Tighten the 4x4 and 6x6 trucks front spring and 4x4 trucks rear spring eye retaining nut in the following order: first tighten the nut of the bolt of the eye to 400-500 N.m (40-50 kgf.m), then tighten the eye U-bolt nut on one branch to 100-140 N.m. (10-14 kgf.m), and after that tighten the second branch nut to 180-220 N.m. (18-22 kgf.m.) and tighten the first nut to the same torque. Nonobservance of the nuts tightening order may lead to stiffening plates and eye U-bolts deformations.

Repair or replace the eye (4x4 and 6x6 trucks front suspension, and 4x4 trucks rear suspension) if there is no clearance (less than 0.2 mm) between the eye and the top spring plate in the section of the fastening bolt.

When mounting the rear suspension on the 4x4 truck, after its repair or replacement, pay special attention to the spring pin correct fastening. Install the washer 18 between the cap 33 and the spring 1 bracket only under the bolt 19 (Fig.51).

WARNING! DO NOT INSTALL THE WASHERS FROM THE FRONT SCREW 21 SIDE.

Before installation lubricate bolts 19, 21 thread and threaded holes with УГ-6 sealant (alternatively with Loctite 243, Loctite 262, Анакрол-202 or Фиксатор-6).

Tighten bolt 19 with 180 to 220 N·m (from 18 to 22 kgf·m) under which there is a shim 18, and then tighten bolt 21. Bolts 19 and 21 tightening in the reverse order is not admissible.

Between the spring bracket 1 and cover 33 on the side of the bolt 21 there should be a clearance within 1 - 2 mm, which ensures the connection efficiency. Should the first leaf ends of the 6x6 trucks rear spring be worn by half of their thickness interchange the first and second leaves. It is not recommended to interchange the leaves on the trucks having a load over 12 000 kg on the bogie.

To dismantle U-bolts 2 of the 6x6 trucks rear suspensions (see Fig. 50) without decoupling the torque rods jack the truck up, place a stand under the walking-beam axle or under the truck frame. Unscrew the U-bolt nuts 4 and take off the spring pad 3. Lower the truck onto the stand in such a way that a gap is available between the spring and walking beam. Turn the walking beam by a small angle and remove the U-bolt.

Remove the aged grease, mud and rust from the walking-beam hubs at every disassembly. Replace the worn out parts (walking-beam bushings 27, guard rings 11) if need be. During the reassembly fill the “g” cavity under the ring 11 edge with grease Литол-24, remount the walking beam, wipe dry the thread of the walking-beam nut 24 and axle and lubricate with grease УГ-6 sealant (alternatively with Фиксатор-6, Анакрол-202, Loctite-243, Loctite-262 243 or 577). Torque the nut 24 to 80 N·m (8 kgf·m), then back off by 1/6 a turn. The sealant squeezing-out into the gap between the end faces of the walking-beam nut 24 and bushing is not allowed. Torque coupling bolt 26 to 44-56 N·m (4.4-5.6 kgf·m).

Fill lubricant Литол-24 into the walking-beam hubs by shooting through the lubricator 22 according to the Chart of Lubricants and Working Fluids. Fill the lubricant in until squeezing through the guard ring 11.

During assembly lubricate bolts 14 thread and threaded holes in walking-beam brackets 16 and 17 of rear suspension with УГ-6 sealant (alternatively with Фиксатор-6, Анакрол-202, Loctite 243, Loctite-262).

Torque the torque rod pin nuts to 600 N·m (60 kgf·m). If the cotter pin holes fail to match with nut slots, tighten up the nut into coincidence and cotter it.

Rear spring torque rod rubber-metal bearings during operation do not require maintenance.

The shock absorber should be disassembled and reassembled in workshops keeping required cleanliness. Polished surfaces of the rod, operation cylinder and other parts should be protected from dents and other damages.

Fill the cylinder with damping fluid in accordance with the Chart of Lubricants and Working Fluids. It is not acceptable to fill the shock absorber with the working fluid in unrestricted amount and to use other fluids as working; the lack of damping fluid can cause insufficient efforts of the shock absorber and the damping fluid excess can cause shock absorber failure.

The shock absorber should exhibit uniform resistance being expanded or compressed. The rebound effort must be within 5.95-8.05 kN (595-805 kgf), while the compression effort must be within 1.52-2.28 kN (152-228 kgf). Rebound and compression efforts decrease of more than

25 % during operation is not allowed. For effort testing use the press with a rod stroke of 100 mm and a speed of 100 strokes per minute. If the shock absorber rod travels freely, it indicates that the unit is faulty.

In case of the fluid leakage from the shock absorber, it is recommended to tighten the shock absorber body nut.

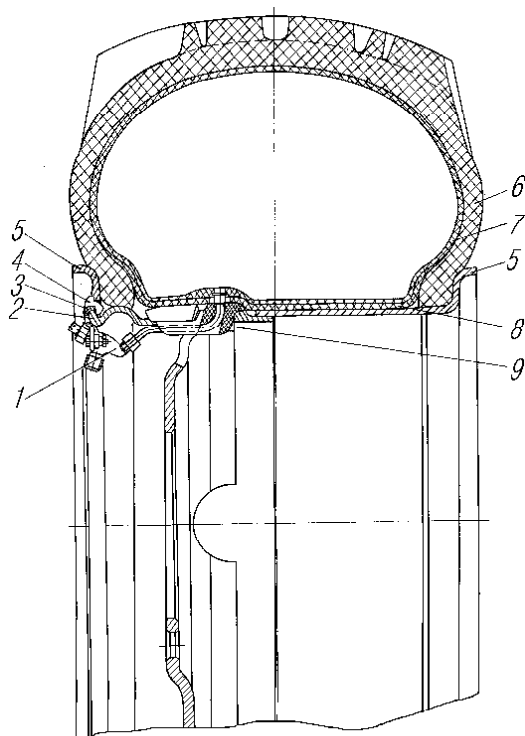
The shock absorber play along the fastening pin or along its axis is not permissible. If necessary, replace the snubber bushings 10, according to the Fig. 48, and snubber bushings 26, according to the Fig. 51. Tighten the nut fastening the shock absorber with 40 Nm (4 kgf m). If the cotter pin holes fail to match with nut slots, tighten up the nut into coincidence and cotter it.

The truck can be equipped with shock absorbers of different manufacturing plants (БА-А3 – Baranovichi, Г3АА – Grodno, ПАА3 – Pervouralsk); such shock absorbers differ in the valve system and specifications. For this reason replace the shock absorbers of the same manufacturer (manufacturing plant information is found on the shock absorbers body or case lower part).

5.3.3 Wheels and Tires

5.3.3.1 The truck is equipped with wheels of disk type and tires with controllable pressure.

The wheel consists of: the wheel valve 1 (Fig. 53), the wheel rim base 2 in assembly with the disk and wheel lock ring stopper 3, wheel lock ring 4 and side wheel 5.



1-wheel valve; 2-rim base with disc; 3-lock ring limiter; 4-lock ring; 5-bead ring; 6-tire casing; 7-inner tube; 8-flap; 9-valve slot seal

Fig. 53. Wheel in Assembly with Tire

The wheel design feature is the toroidal bead seats which provide the reliable fit of the tyre to the rim at any stage of air pressure control. There is a well on the rim base for the wheel assembly and disassembly.

The wheels can be used both with detachable and nondetachable bead edges on the side opposite to the lock part.

The bead and lock rings of the 254Г-508 and 400Г-508 wheels are interchangeable and are mounted on these wheels in a strictly determined position with the help of the lock ring limiters welded to the rim and pressed out pieces on the lock rings, which enter the appropriate recess (slot) on the bead rings. The second slot on the bead rings is used, when dismantling the wheels. On one of the lock ring ends a slot for gripping the ring, when taking it out of the rim lock groove, is.

The lock ring limiters serve to prevent turning the rings over, when the truck travels with reduced tire pressure, and at the same time they are the brackets, which wheel valves 1 are fastened to (Fig.53), and additional supports for protection hoods of air supply hoses.

On the 254Г-508 wheels, the wheel valve is mounted on the outer side of the limiting bracket, on 533-310 and 400Г-508 wheels – on the inner side.

Rubber seal 9 of the wheel valve slot do not allow mud inside the tires and ensure that the inner tube valves are set in a certain position.

The nuts and studs, fastening the wheels on the left and right sides, have a right-hand thread.

5.3.3.2 Wheels and Tires Servicing

5.3.3.2.1 A longer operating life of the wheels and tires as well as their safety may only be achieved if they are regularly serviced and if all the operation rules of the truck tires, traffic regulations, safety rules and precautions are observed.

Follow the next general rules:

- strictly observe the norms of tire internal pressure;
- maintain the wheels and tires in due time;
- keep units of the running gear, steering and brakes in good working order;
- stick to rules and use rational technique of driving, taking into account road conditions, strictly observe the rules of using controllable-pressure tires at reduced air pressure, set forth in Subsection «Precautions» and «Truck Driving».

5.3.3.2.2 Maintenance. Every day before your departure check up the tire pressure and, if required, bring it to norm.

Set the tire pressure on a fully loaded truck and check it when the tires are cold.

When conducting the daily maintenance, check up the condition of the tires, wheels and their fastening parts. The tires should not have any damages, unrepaired local damages (punctures, cuts), local separation of tread and sidewall, and the wheels should not have mechanical injuries, rust and cracks on their parts. The tires in terms of their wear should be suitable for operation. Remove alien objects stuck in the tread and sidewall. The valves of the tire inner tubes should always be in good working order.

Make sure no fuel, oil and other petroleum products contact the tires, because it puts them out of order quickly.

When discovering faults relating to the tires and wheels, take measures to remedy them, repair or replace them.

If intensive and uneven wear of the tire tread, which as a rule is not only a result of improper driving, but that of the faulty running gear, steering and brakes, has been discovered, its reasons should be found and the faults should be eliminated.

Slacking of the wheel fixing and operation of the truck is not allowed even if a single nut or stud fastening the wheel is missing or fastening holes in the disks are worn-out.

Every time you install the wheel on the hub irrespective of the reason of its removal, tighten up the nut fastening the wheels twice: for the first time after the run of 100-150 km and for the second time — after 200-300 km.

When conducting the second maintenance of the truck on the whole, it is required to check condition of the wheels and tires, and if any fault has been discovered, repair or replace, balance or rearrange them, tighten up the nuts fastening the wheels, if the wheels assembled with tires could not have been removed from the truck. Besides that, while conducting the second maintenance, check up the adjustment of wheel convergence and angles of setting the front wheels, blow through all the lines and hoses of the tire pressure control system.

5.3.3.2.3 Tire mounting and dismantling. When mounting and dismantling the tires, the following rules should be observed:

- deflate the tire completely;
- assemble and dismantle the tires on a specially equipped area using special equipment, devices and tools. In field conditions use the tools from the kits, take measures so that no sand and dirt get into the tires;
- the tire casings, inner tubes and flaps should be clean and dry;
- use the tires of the same size, make, ply-rating. Pay special attention to the correct selection of tires according their centerlines (wear);
- the tires, which have been stored at a temperature below zero, are recommended to be warmed up in a warm room to a temperature above zero;
- direction of wheel rotation should coincide with that of the tread pattern;
- rims and their elements should not have damages, bends, cracks, sharp edges and burrs, corrosion both on the exterior and interior sides and in the points of contact with tires, worn-out fastening holes;
- when mounting the tires at a workshop, check the rim for radial and axial wobbling that should not exceed 4 mm.

5.3.3.2.4 Before assembling the wheel check up technical condition of the tire casing, inner tube, flap, lock and bead rings.

Examine the exterior and interior of the tire casing with the help of a bead expander, remove alien objects (sand, small stones, etc.) from its interior part, wipe the inner and setting surfaces of the tire casing, eliminate damages and galling of the beads, cut the rubber projections and fins flush-mounted with the main surface of the bead rubber. Powder the tire casing interior and the inner tube and flap exterior with talc.

To make the assembly easier and ensure the complete setting of the tire onto the setting surfaces of the rim it is recommended to apply soap solution, glycerin or liquid paraffin onto the tire casing beads. Do not use mineral oil (solid oil, engine oil, etc.) as a lubricant).

If manufacturing or operational defects have been detected, it is not allowed to use the tires for mounting.

Check the inner tubes and valves for sealing; do not use the inner tubes with separation in the joint and the damaged valve.

Remove mud, rust and the rest of rubber from the wheel surface, especially from the surface of the rim, bead and setting rings, which face the tire, and in the welded seams area. Paint

trimmed spots and the spots, where paint is damaged, with a fast-drying enamel, having eliminated burrs and metal scores first.

Check setting of the locking ring on the rim and on the control cylinder having the same diameter:

- clearance in the seam between the ring ends should be 45-55 mm, loosening of the ring ends from the rim — 1.5 mm, along the arc up to 50 mm;
- local clearances between the lock ring and rim should not exceed 1.5 mm and smoothly decrease to both sides along the arc not more than 1/4 of circle;
- twisting of the lock ring should not exceed 15 mm.

If the clearances and twisting of the lock ring exceed the said numbers, the ring is not suited for assembling and should be fluted and squeezed or replaced by a new one.

The wheel parts, which have infringed shape and cracks, should be rejected as well.

The wheels and tires, which are only in good working order, are subject to mounting (operation).

When mounting and dismantling tires, the safety regulations should be observed as follows:

- do not remove and do not put the wheel with tire onto the truck, if you are not convinced that the wheel has been hung up securely. Slack off and tighten the nuts on the truck that is not hung up and is braked. Final nuts tightening should be done in a criss-cross manner;
- deflate the tire before taking the wheel off the hub and before disassembling the tire from the rim;
- do not use sledge hammers, pinch bars, faulty installation tools and the tools, which are not provided by technical documentation, and can deform or cause mechanical damages of wheel components, cuts and breaks of the tire casing beads, injuries of the inner tube and flap;
- do not mount the tire onto the rim that does not conform to these tire sizes;
- do not use the bead and lock rings from a different type of wheel, because they can have different design dimensions (regarding diameter and profile), even with the same model of trucks, which have been produced on different dates and have got different design of their wheels;
- do not set additional bead rings onto the rim to reduce its width;
- do not use the rims, bead and lock rings, which are noncircular and have damaged surfaces, local dents, cracks as well as mud, rust and excess paint;
- do not operate the truck if a single nut or stud fastening the wheel is missing or fastening holes in the disks are worn-out or wheels have wobbling;
- do not use the tires, which have maximum wear of their tread pattern (residual depth of protrusions less than 1,6 mm) or tires with ply separation of the tire carcass, peeling of the tread pattern or sidewall, non-repaired local damages, cuts or breaks, which reach the cord, and through punctures or injuries of the metal bead rings of the tire casings;
- do not allow to mount the tire casings, which have excess rubber, pressed-out rubber and flashes on the edge, scores and damages, which obstruct mounting;
- when mounting or dismantling tires, do not apply rough force to tire irons; the force applied should not result in their sliding off or break of tire iron ends;
- first, make sure that the lock ring occupies its proper position in the rim base groove, which corresponds to the inflated wheel, and then inflate the tire;
- do not inflate the tire outside a special protection enclosure, and the tire to be inflated should not be mounted on the truck; in the field use the safety devices, which prevent ejection of parts, if spontaneous dismantling or wheel break occurs;
- do not inflate the tires from the bottles with compressed air or gas as it will cause tire destruction and injure the people, who stand nearby.

Inflate the tire in two stages. At first inflate it to the pressure level of 0.05 MPa (0.5 kgf/cm²) and check the position of the lock ring. Then adjust the pressure to the rated one. In case of incorrect set of the wheel lock ring deflate the tire, reposition the ring and reinflate the tire till the pressure reaches 0.05 MPa (0.5 kgf/cm²).

In case the tire beads with a loose fit the rim seats after the inflation, deflate and dismantle the tire and eliminate the cause of the loose fit to the tire beads. Then remount the tire on the rim, reinflate the tire and check the fit of the tire beads;

- do not correct the position and do not hit the bead ring and wheel lock ring, when the tire is pressurized, as well as when inflating or deflating the tire.

Remember that the operations performed properly, when dismantling and mounting the tire, ensure safety and reduce the labor consumption, when doing the job, allow to extend the service life of the tires, wheels and installation tools.

5.3.3.3 Wheel disassembling

1. Place the wheel on an even, clean site with its lock part upwards, deflate the tire completely, for the controllable-pressure tires disconnect the valve from the wheel valve and recess it together with the seal into the hollow of the tire casing, remove the wheel valve. Apply marks indicating the position of the balancing weights onto the rim and tire of the balanced wheel and remove the weights.

2. Remove the tire bead from the bead seat. For this purpose insert the flat end of the short tire iron into the dismantling slot between the bead and lock rings and press out the bead ring downwards, and insert the flat end of the second tire iron into the gap appeared (Fig. 54, I). Pressing both irons and rearranging them by turns around the circle at a distance of 50 – 100 mm from each other, upset the bead ring to some extent downwards together with the tire bead, and then, using the hook-like end of the large tire iron, completely remove (upset) the tire bead along its whole length from the bead seat.

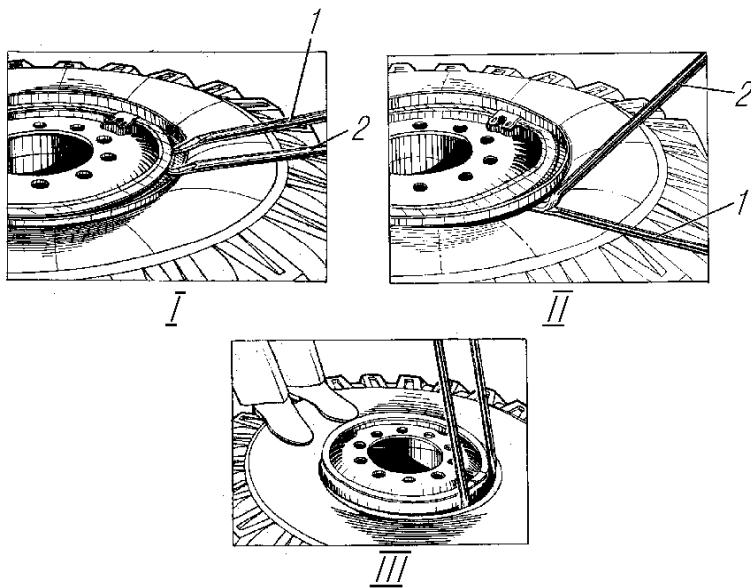
If it is difficult to remove the tire bead from the bead seat after a long use as well as when removing it on the side of the bead fixed edge, the bead should be removed from the bead seat, directly catching the bead with the tire irons. For this purpose:

- insert the flat end of the short tire iron between the tire bead and the wheel bead ring as deep as possible, press out the tire iron downwards;

- then, between it and the bead edge (bead ring) insert the hook-like end of the large tire iron so that the flat end of the short tire iron locates in its slot (it is permitted to use a hammer) and rest the second tire iron on the first one, having caught the bead ring by its hook-like end, pressing out both tire irons simultaneously (Fig. 54, II), upset the tire bead downwards;

- repeat this procedure, gradually moving around a circle, remove the tire bead from the bead seat. The distance between the points, where the tools are inserted at the initial moment, should not exceed 100 mm.

The toroidal shape of the setting surface of the rim does not allow to perform local removal of the tire casing beads; that is why labour input and time of disassembling reduce significantly, when upsetting the tire casing bead gradually by two- or three-stage application of efforts along a circle.



I, II-removing of tire bead from bead seat; III-dismantling tire bead from rim; 1, 2-tire irons

Fig. 54. Wheel Disassembling

3. Remove the lock ring. For this purpose insert the flat end of the short tire iron into the dismantling slot of the lock ring and press its end out of the rim; then move the lock upwards, using the second iron, and completely release the lock from the rim by pressing it out of the rim and gradually moving along the wheel circle.

4. Remove the bead ring from the rim.

5. Dismantle the tire bead:

- stand on the tire on the side opposite to the inner tube valve, upset the tire casing down to the mounting groove and insert a part of the tire bead in it;

- insert flat ends of the tire irons between the tire rim and bead in the valve area at a distance of 200-250 mm from each other (Fig. 54, III) and pressing them, move a part of the bead through the bead seat upwards (take it to the outside of the rim). In so doing the opposite side of the tire bead must be in the mounting groove of the rim;

- holding the dismantled part of the tire bead with one of the irons, completely move the bead along its whole length upwards, using the other iron, inserting sequentially its flat end between the rim and tire at a distance of 70-100 mm to the right and left of the place, where the tire bead goes to the outside. To avoid the bead injury insert the tire irons for the whole width of the bead.

6. Turn over the tire and the wheel with the lock part facing downwards and remove the tire bead from the second bead seat, following the procedure described in paragraph 2.

7. Take the rim out of the tire:

- set the wheel with the tire in the upright position with the lock part away from you so that the inner tube valve is at the bottom, recess the valve with the seal to the inside of the tire;

- holding the tire by hand in the upright position and leaning it against a support, pull the rim by the other hand, avoiding skewing, so that the tire bead at the bottom enters the mounting groove;

- taking hold of the disk or upper part of the rim, extract the rim out of the tire, preventing its falling down.

If the flap is stuck, separate it with the tire iron.

5.3.3.4 Wheel assembling

1. Put the inner tube and flap in the tire casing and pump up the inner tube a little so that it takes its natural shape; in so doing it should not be tight against the tire casing. For the control-pressure tires put the inner tube in the tire casing, taking a direction of wheel rotation into account, put the seal on the valve so that its stem is in the seal body.

2. Put one of the bead rings with its edge downwards on the rim set with its lock part, facing upwards.

3. Put the tire on the rim:

- put the tire inclined on the rim so that its bottom part with the valve, facing upwards, is spaced from the rim. Align the valve with the seal strictly opposite to the valve slot of the wheel and insert the valve and nut in the valve slot, moving the tire to the rim or away from the rim, if required;

- lift up the bottom part of the tire on the side of the valve slot and move it on the rim so that the lower bead enters the mounting groove; in so doing the tire by its own weight will be put on the rim. If the tire hangs on the bead seat, upset it by swinging, and make sure that the valve is not skewed in the valve slot, and the flap is not pinched;

- slightly recess the lower part of the seal inward the tire by a tire iron first and then insert the guide part of the seal with the valve in the rim slot.

4. To mount the second bead of the tire onto the rim stand onto the tire on the side opposite to the valve, recess this part of the tire casing bead into the mounting groove; in so doing the tire bead in the zone of limiter should be at the top, above the rim. If any difficulty occurs, upset a part of the tire bead behind the bead seat with the help of the tire irons as shown in Fig. 55.

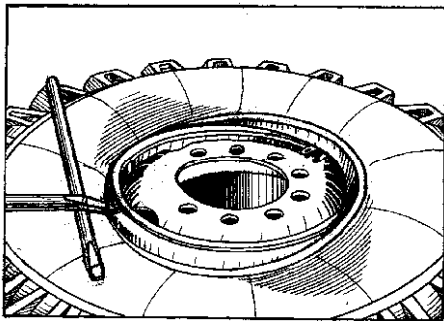


Fig. 55. Inserting Tire Bead in Rim Mounting Groove

Hold the bead by the short tire iron first in the zone of bracket, keeping it from movement towards the centre, then manipulating by the other tire iron in the rim groove, using a flat or hook-like end of the iron by turns and beginning from the side opposite to the bracket, displace the bead along its whole length through the bead seat. Upset a part of the bead in the zone of valve in the last turn, a little bit lower than the rim edge, down to the level, which ensures the installation of the lock ring, otherwise, the valve slot seal will be displaced, and further assembly will be impossible.

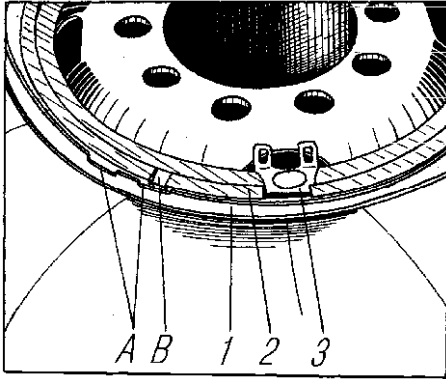
5. Mount the bead and lock rings, having aligned stamped-out mark «B» (Fig. 56) on the lock ring of the constant-pressure tires with one of slots «A» on the bead ring and having ensured that the cut of bead ring coincides with the limiter on the rim.

6. Check position of the valve and seal in the valve slot and if required, adjust them; connect the inner tube valve with the wheel valve. Mount the valve on the outer and inner side of the locking ring limiter, depending on wheel design, and upon connecting the valve and inflating the tires, fasten the valve as far as possible from the wheel centre.

7. Inflate the tire, observing the following order:

- centre the bead and lock rings relative to each other;

- inflate the tire up to pressure of 50 kPa (0.5 kgf/cm²) and make sure that the lock and bead rings have not been displaced relative to their working position. It is advisable to inflate the tire, when the wheel is set in its horizontal position.



1 - bead ring; 2 - lock ring; 3 - bracket; A - slots on bead ring; B - stamped-out mark on lock ring

Fig. 56 - Position of Lock and Bead Rings

If the wheel is set in a wrong position, deflate the tire, correct the position of the rings and re-inflate the tires up to pressure of 50 kPa (0.5 kgf/cm²). When deflating the tire, disconnect the air supply hose not from the wheel, but from a source of compressed air. It is allowed to disconnect the hose from the wheel only after deflating the tire completely.

If the rings have been reinstalled incorrectly, replace defective parts, make sure that the bead and lock rings are installed properly (at a pressure of 50 kPa (0.5 kgf/cm²), inflate the tire up to the pressure that ensures setting of the tire beads on the bead seat, and then inflate the tire up to its nominal pressure.

Contrary to the wide-spread design of wheels with conical bead seats, setting of the tire beads onto the toroidal bead seats under increasing inner pressure does not happen gradually, but instantly, usually at a pressure of 450-500 kPa (4.5-5.0 kgf/cm²), which exceeds nominal pressure to some extent.

8. Mount the wheel onto the hub and fasten it, the tightening torque of the nuts fastening the wheels should be 400-500 N.m (40-50 kgf.m).

To connect the wheel inflation hose to the wheel valve mount the wheel relative to the hub cap so that the inflation hose is symmetric between the studs, fastening the wheel on the side of the wheel valve.

When mounting the wheel, tighten the nuts, fastening the disk to the hub in the following order:

- screw all the nuts onto the studs manually;

- first tighten the nuts by a wrench with the wheel being lifted. In so doing screw the nuts, alternating them or crosswise. When screwing in the first five nuts, make sure that the nuts are centered with their spherical chamfers in the spherical chamfers of the fastening holes of the wheel disks. The nuts should be tightened securely, because their insufficient and uneven tightening can result in lateral runout of the wheels assembled with tires.

5.3.3.4.1 Balancing of wheels assembled with tires. In the course of operation, as the tires are wearing and by other reasons (remounting of the tires) the initial balance infringes; there-

fore, when the truck travels, oscillation and vibration, especially those of the front wheels, can occur.

The unbalance causes rapid wear of the treads, wear of the steering and suspension components as well as makes the control over the truck more difficult. It is recommended to perform static balancing of the wheels assembled with tires. Unbalance can be remedied by means of mounting the balancing weights, which are held on the bead ring by a plate spring. The mass of the single balancing weight is 0.38 kg. To remedy unbalance from 5.2 to 15.2 kg·cm, mount one weight, from 15.2 to 25.2 kg·cm – two balancing weights; from 25.2 to 35.2 kg·cm — three balancing weights. **The permissible unbalance is 5.2 kg·cm.**

Prior to balancing remove mud and alien objects from the wheel and tire.

The tire pressure should be nominal. The wheel and tire on a special device is based over the plane of the disk and over spherical chamfers of the fastening holes, when balancing it.

The order of installing the balancing weights is as follows:

1. Deflate the tires.
2. Press the tire bead out of the bead ring with a tire iron, where the balancing weight is placed, until a clearance of 1-2 mm appears.
3. Mount the weight with the spring onto the bead ring, holding them by hand, set the spring beyond the bead ring edge, slightly hammering it, and upset it completely. If the spring is set incorrectly, it can slip off the bead ring abruptly, therefore, be careful.
4. Inflate the tire to its nominal pressure.
5. Reset the balancing weights, if they have displaced regarding perimeter or got out across the bead ring radius.

To remove the balancing weights insert a screwdriver between the spring and weight, press the spring out of the bead ring until releasing the weight, remove the weight and spring.

Balance and remount the wheels as required. The tire replacing diagram is shown in Fig. 57 and 58.

In the course of the tire operation observe the «Rules of Vehicle Tire Operation» («Khimiya» Publishers, Moscow, 1983).

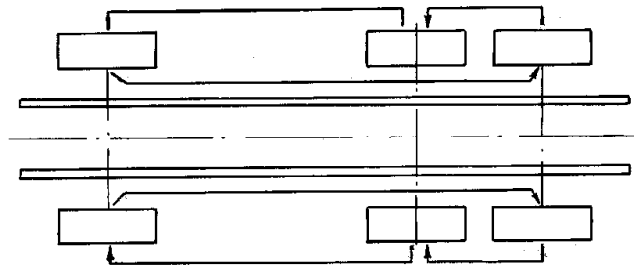


Fig.57 - Truck Wheel Rotation Diagram (for 6x6 trucks)

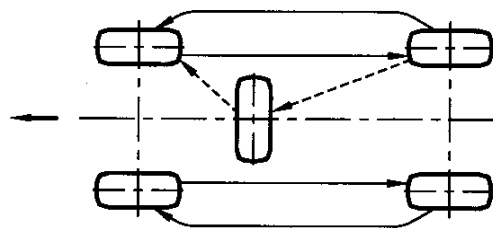


Fig. 58 - Truck Wheel Rotation Diagram (for 4x4 trucks)

5.3.4 Spare wheel holder

The spare wheel holder on the trucks can be mounted in an upright or horizontal position. The design of the upright holder is shown in Fig. 59.

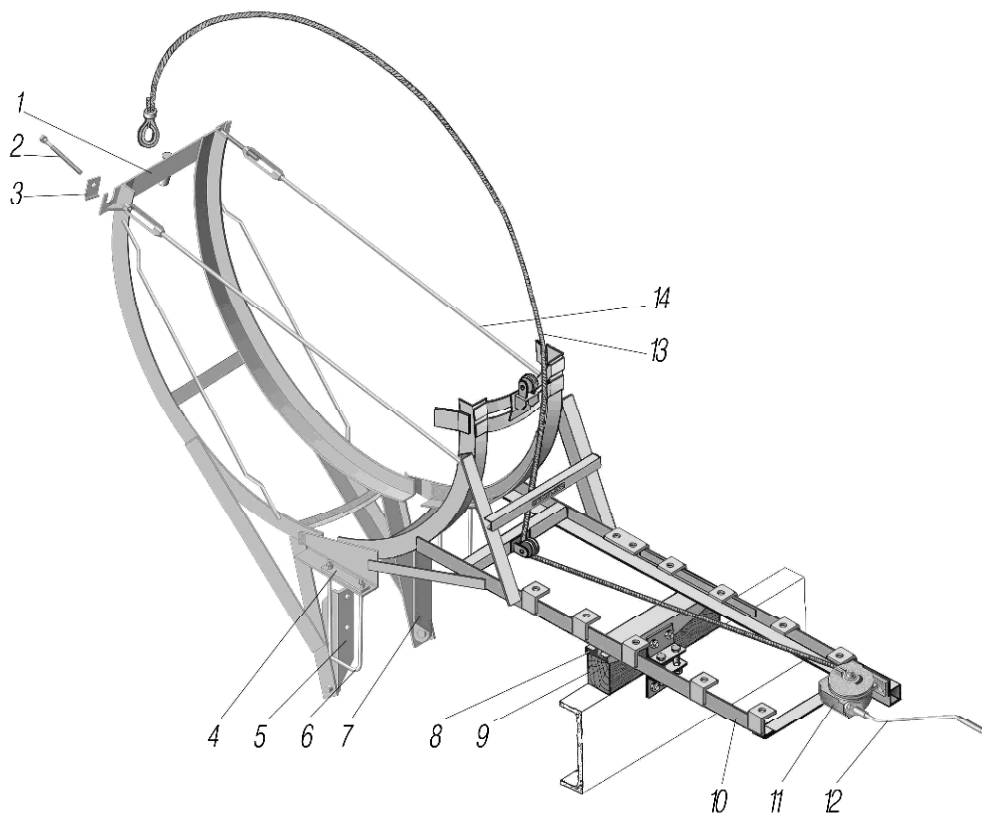
The base of the spare wheel holder and tilting bracket are made of rolled profiles welded to each other.

The spare wheel holder is lifted and lowered down with the help of a worm reduction gear 11. The spare wheel is fixed in its transportation position by braces 14 and bolts 2. Before lowering down the spare wheel holder, dismantle the side protective device. When lowering down the spare wheel, release the fastening of tilting bracket 1 from braces 14, having checked fixation of rope 13 to the tilting bracket first. Put the detachable handle 12 on the reduction gear shaft.

Turning the handle, lower down the tilting bracket with the spare wheel. When the spare wheel has been lowered down, remove rope 13 from it, not disconnecting it from tilting bracket 1 without necessity, and roll out the wheel.

The spare wheel should be lifted and fixed for transportation in the reverse order, after that the rope tensioning is slacked off.

Maintenance of the spare wheel holder lies in checking of the spare wheel holder fixing to the truck frame and fixation of the wheel in the holder.



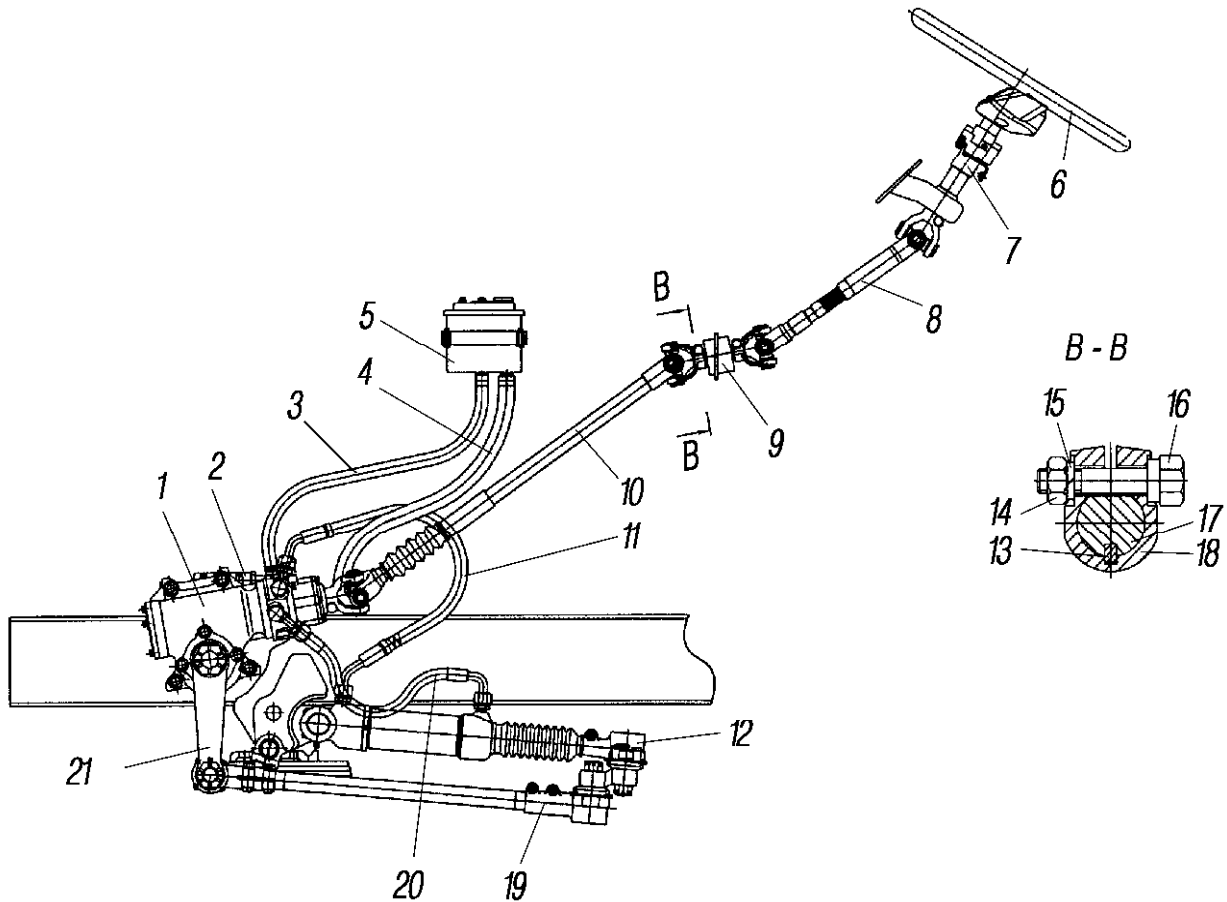
1-tilting bracket; 2-bolt; 3-brace; 4-U-bolt lining; 5-front bracket; 6-U-bolt; 7-rear bracket; 8-bar gasket; 9-base bar; 10-holder base; 11-hoisting reduction gear; 12-detachable handle; 13-reduction gear rope; 14-bracing wire

Fig. 59. Upright Spare Wheel Holder

5.4 STEERING

5.4.1 Steering

5.4.1.1 The steering system (Fig. 60 «Steering with Screw - ball nut-rack – segment type» consists of the steering column, steering gear, steering linkage and hydraulic booster.



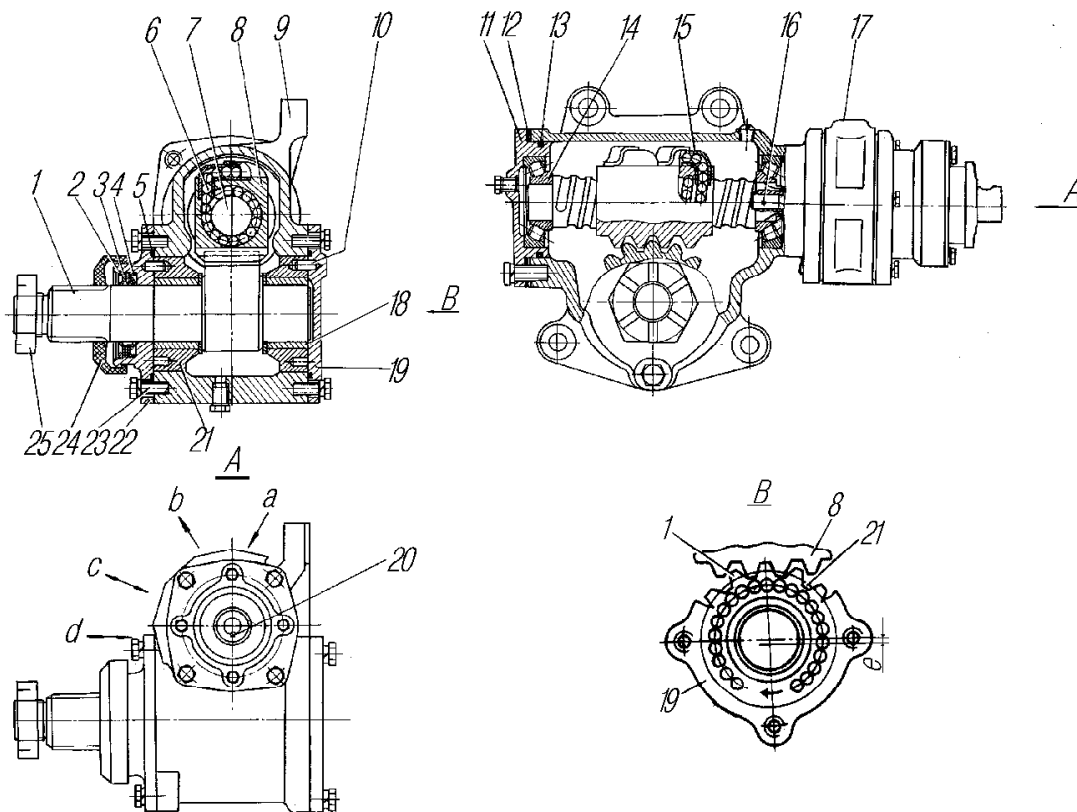
1-steering gear; 2-pump 3,4-low pressure hoses; 5-oil tank; 6-steering wheel; 7-steering column; 8,10-steering system propshafts; 9-intermediate support; 11,20-high pressure pipe; 12-booster; 13-key; 14-nut; 15-washer; 16-bolt; 17-shaft; 18-cardan fork; 19-pitman arm; 21-pitman

Fig. 60. Steering with Steering Gear (screw-ball nut-rod-segment)

5.4.1.2 **Steering gear with distributor (Fig. 61)** comprises screw 7 and ball nut-rack 8, coupled with segment 1. The semicircular helical grooves on the screw and the nut form the flute filled with high precision balls 6 when the unit was assembled.

The gear sector 1 is installed in the bearings 18 which are pressed into the collar steps 21 having a number of holes on the end faces for the gearing adjustment. The outer surface axes of the collar steps 21 are offset relative to the bearings 18 hole axes. The gap between them is equal to the gap of «e» off-set which lets adjust the gearing of the sector-nut-rod by turning the collar steps 21.

The face of the splined end of the sector 1 has a match mark which is aligned with the match mark of the plain arm face end.



1-to the power cylinder 1-sector; 2-lock ring; 3-protecting ring; 4-sleeve; 5,13-packing rings; 6-balls; 7-screw; 8-nut-rod; 9-crankcase; 10-lock; 11,19,22-caps; 12-shim washers; 14-bearings; 15-guide; 16,20-pins; 17-distribution valve; 18-bearings; 21-insert; 23-bolt; 24-seal; 25-nut; a – from the pump; b-drain; c,d - to the power cylinder; e-eccentricity

Fig. 61. Steering unit (screw-ball nut-rod-sector)

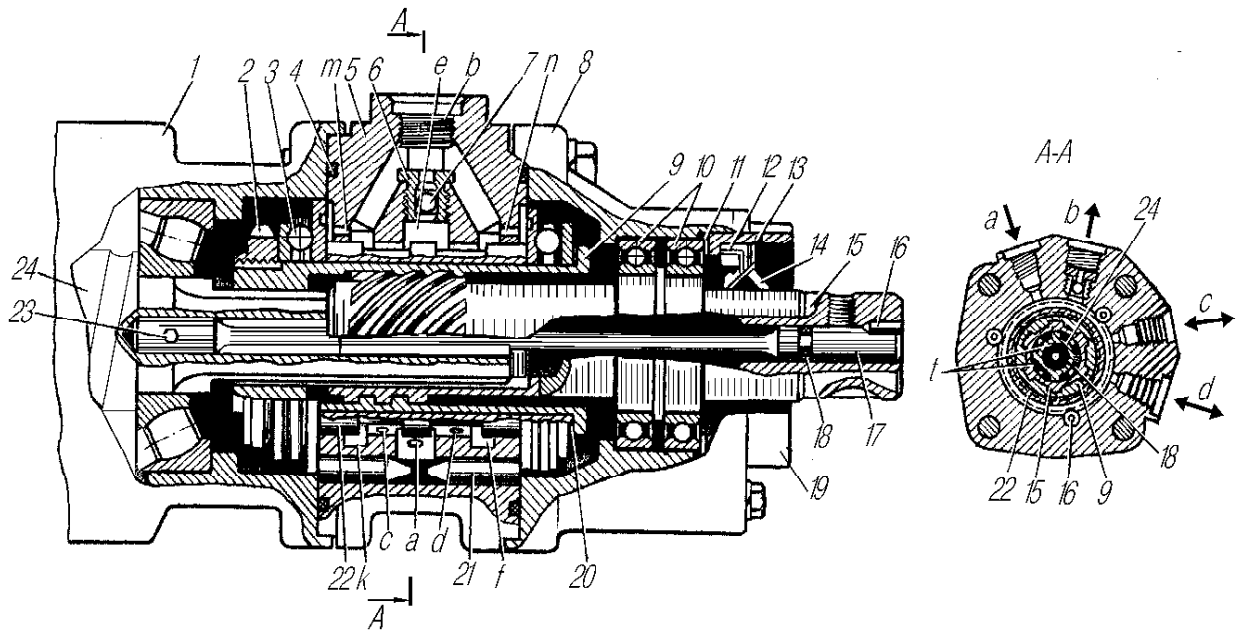
5.4.1.3 Distributor (Fig. 62) is installed in the steering unit.

There are three circular grooves «e», «k» and «f» in the slide valve case 5. The middle circular groove «e» is connected with the channel «a» for the service fluid intake from the pump, the boundary grooves «k» and «f»-with the channel «b» for the service fluid offtake to drain it.

The three reaction chambers of the casing 5 have the rams 21 which can be displaced axially in their channels.

The slide valve 22 is fixed through the bearings 3 by the nut 2 on the bushing 9. The bushing 9 of the steering unit is connected with the screw 24 with the splines without the side clearance but with the option of axial displacement as well as with the screw joints connected with the input shaft 15. The splined joint of the shaft 15 and the screw 24 has a side clearance «t». The clearance is chosen to provide full travel of the slide valve.

The input shaft 15 is also connected with the screw 24 of the steering unit by the torsion bar 17. The back pressure valve 6 is in the middle groove «e».



1-steering gear case; 2-nut; 3,10-bearings; 4-packing rings; 5-slide valve body; 6-back pressure valve; 7-ball; 8-distributor unit case; 9-bushing; 11,20-shim washers; 12-sleeve; 13-retaining ring; 14-ring; 15-shaft; 16,23-pins; 17-torsion bar; 18-packing ring; 19-cap; 21-rams; 22-slide valve; 24-screw; a-groove for the service fluid intake from the pump; b-groove for the service fluid removal from the pump; c,d-grooves for the service fluid intake (off take) to/from the booster unit cavities; e,k,f-circular grooves; m,n-bores for the connection of the casing cavities and the distributor unit cap with the drainage piping; t-clearance

Fig. 62. Hydraulic steering booster distributor unit

5.4.1.4 Steering operation. With the truck's direct movement when there is no steering effort on the steering wheel, the slide valve is in the neutral position in the casing.

The service fluid from the pump goes to the middle groove «e» (see Fig. 62). In this position of the slide valve the grooves «e», «k» and «f» are interconnected, the oil fills the grooves and the reaction chambers, goes from the distributor valve through the boundary grooves «k» and «f» and the groove «b», then it is poured into the oil tank. With the steering turn to the right, e.g., the bushing 9 with the slide valve 22 fixed on it offsets to the left affected by the threaded joint (in the direction of the steering unit).

At the beginning of the movement when the pressure in the hydraulic system is not high, the steering effort on the steering wheel is basically created by the torsion bar twist which directly affects the shaft 15. The threaded joint moves the slide valve and bears nearly no load. When the slide valve whose travel is limited by the clearance «t» in the splined joint, moves, the service fluid supply to the circular groove «f» shuts off. The fluid is pumped to the middle groove «e», then through the groove «d» in the casing and along the piping to the head end of the booster unit 21 (see Fig. 60).

The effort from the booster unit is transferred to the steering knuckle lever of the front steerable axle. The wheels are turned to the right.

From the rod end of the booster unit the fluid is delivered in the pipelines through the groove «c» (see Fig. 62) of the distribution unit to the circular groove «k» and further through the groove «b» to the tank.

When the wheel turn resistance is increased, the pressure in the hydraulic system as well as in the reaction chambers rises. It creates proportional effort on the steering wheel.

Thus a driver receives information about the increase in steerable wheels turn resistance.

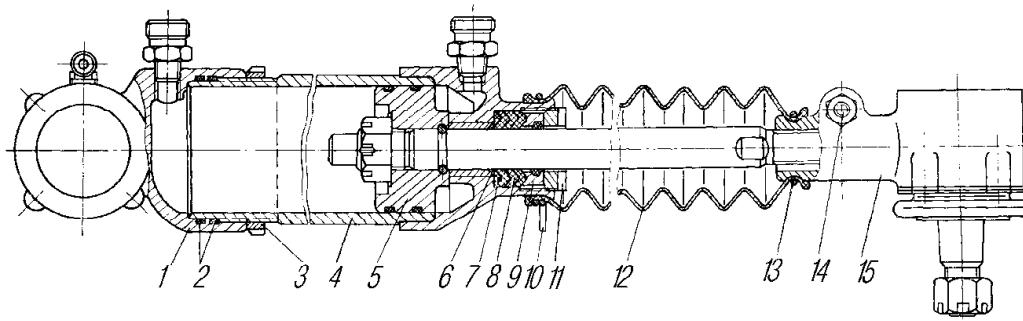
When the steering wheel is not turned (there is no effort on it) the torsion bar 17 and the rams 21 return the slide valve to the neutral position. The fluid supply to the rod end of the booster unit is stopped and the truck is driven in a circumferential direction of the set radius.

When the steering wheel is turned left, the bushing 9 with the slide valve 22 offset to the right (away from the steering unit). The fluid is pumped to the groove «e», then through the groove «c» to the rod end of the booster.

If the hydraulic booster is faulty, the back pressure valve 6 provides the by pass of oil from one cavity of the booster unit to the other one which facilitates driving.

5.4.1.5 Steering Booster. The booster unit cushions the impact transferred to the steering wheel when the truck is driven on a bumpy road, enhances driving safety, allows the truck to be driven in the initial direction if the front tire is punctured, decreases the effort needed turning the wheels.

The booster unit is connected with the frame and the rh lever of the front axle steering knuckle by the joints. The rod length is adjusted in the range which provides the specified turn angles of the front wheels. To change the rod length, loosen the screw 14 (Fig. 63) of the end clips, remove the protecting coupling 12 and rotate the rod with the wrench in any direction. If there is leakage along the rod, compress the seal with the nut 11.

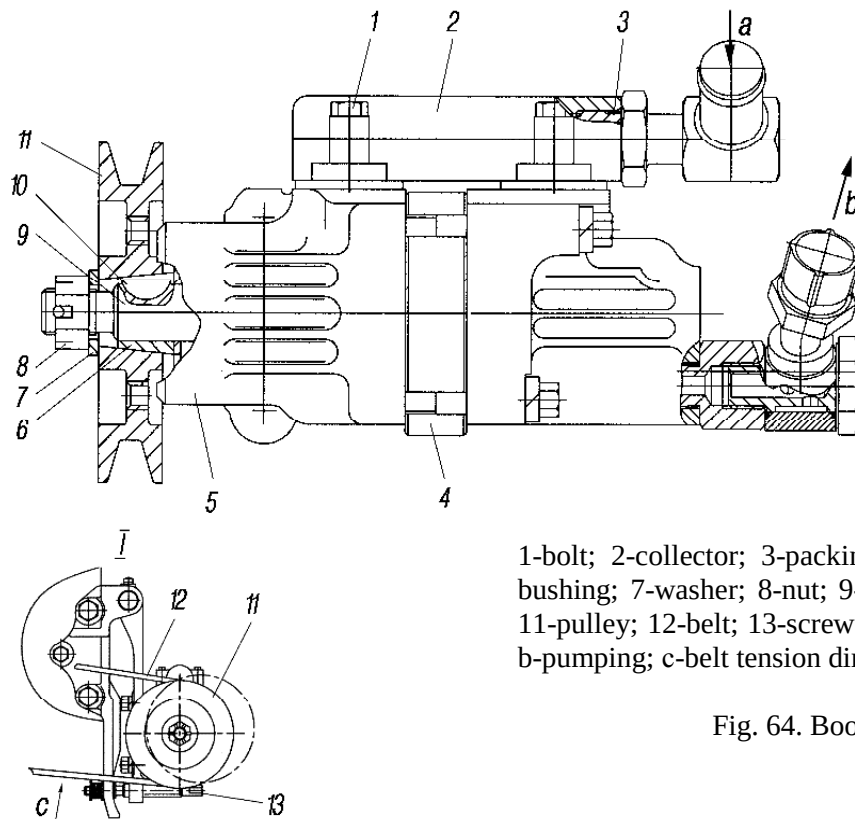


1-cylinder end; 2,6-packing rings; 3-rod end nut; 4-cylinder; 5-piston with rod; 7-supporting ring; 8-collar; 9-pressure ring; 10,13-attachment clips; 11-nut; 12-protecting coupling; 14-bolt; 15-rod end

Fig. 63. Booster unit

5.4.1.6 Booster Unit Pump. The booster unit pump (Fig. 64) is a blade-type and bilateral. During pump shaft rotation the pump blades cling to the curved surface of the stator under the action of centrifugal force and oil pressure under the stator. In the suction chambers the oil flows into the space between the blades and is then expelled from the decreasing space with the rotor wheel rotation.

The end surfaces of the casing and the distribution disk are polished. Nicks and burrs on them as well as on the rotor, stator and the blades are not admissible. Two valves are located in the pump cap. The bypass valve limits the amount of oil fed by the pump into the steering cylinder. The safety valve inside the bypass valve limits the oil pressure in the system, opening at the pressure of 7,500-8,500 kPa (75-85 kgf/cm²). Control the hydraulic steering booster pump belt tension with the force of 40 N (4 kgf) in the middle of the branch as indicated by the arrow «b». The allowable deflection should be 7-13 mm. Adjust the belt tension with the square-shank screw 13.

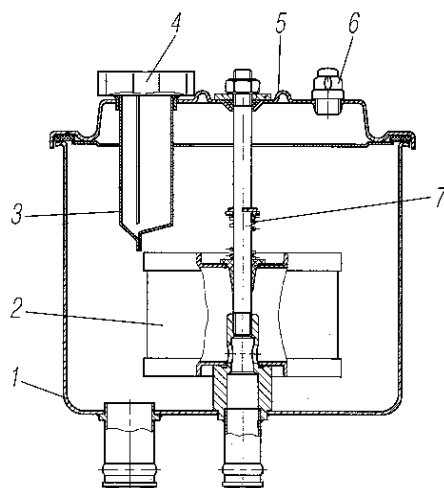


1-bolt; 2-collector; 3-packing ring; 4-stator; 5-casing; 6-bushing; 7-washer; 8-nut; 9-roller; 10-segment dowel pin; 11-pulley; 12-belt; 13-screw; I-pump installation; a-supply; b-pumping; c-belt tension direction

Fig. 64. Booster unit pump

5.4.1.7 Steering Oil Tank. The tank is separated from the pump. The tank has a filter 3 (Fig. 65). Oil returns to the tank through the filter 2. If the filter elements 2 get clogged, the latter rises compressing the spring 7, and oil flows into the tank, avoiding the filter. The oil level in the tank is measured by means of the indicator with the plug 4 unscrewed.

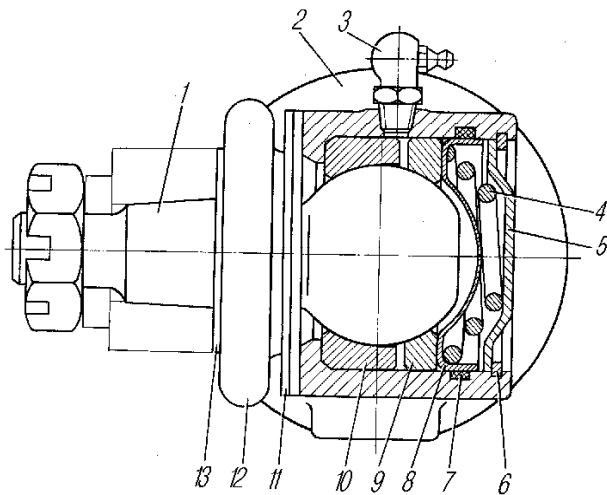
The oil level should be within the indicator marks.



1-casing; 2-filter; 3-filler filter; 4-filling neck plug with the oil level indicator; 5-cover; 6-breather; 7-spring

Fig. 65. Steering oil tank

5.4.1.8 Steering Rods. The length of the drop arms of the steering system and the steering linkage can be adjusted. The steering linkages and booster unit hinged joints have the collar steps 9 and 10 (Fig. 66). The hinged joints are not adjustable during operational process. The permissible cumulative clearance in new hinged joints in the direction perpendicular to the finger axis is up to 0.3 mm.



1-ball pin; 2-rod end; 3-grease-nipple; 4-spring a; 5-socket plug; 6-retaining ring; 7-seal; 8-spring holder; 9-bottom collar step; 10-top collar step; 11-stiffening plate; 12-protective coupling; 13-washer

Fig. 66 - Steering Hinge

5.4.2 Steering System Maintenance

5.4.2.1 The steering system maintenance consists of regular inspection of the steering system fixation, the piping, the protective coupling of the booster unit rod, the free travel of the steering wheel as well as servicing the hydraulic system assemblies. Assemble and disassemble the units only when necessary and in complete cleanness. Replace the rubber rings if they lose elasticity and their sealing properties.

Before disassembling the pump mark the valve plate position in its relation to the stator, as well as the stator position in relation to the pump casing (the arrow on the stator indicates the direction of the pump shaft rotation).

The stator, rotor and booster unit pump blades, as well as the bypass valve and the pump cap, are individually selected, so do not disarrange their set.

If the rotor, casing and valve plate butt ends have minor burrs, grind the surfaces to each other. When disassembling the pump, make sure that rubber packing rings are intact. Before assembly rinse the pump parts, the booster unit and the control valve in kerosene or petrol, dry (but do not wipe) and lubricated with oil. Rinse the filter strainers in kerosene or petrol and blow them off.

When filling the steering linkage hinged joints with lubricant make sure that protecting collars are not visibly distorted under the lubricant pressure.

5.4.2.2 Changing of oil in steering hydraulic system:

1. Warm the engine; the oil temperature in the steering hydraulic system should be not lower than 20 °C.
2. Jack up the front axle.
3. Turn the wheels to the right as far as they will go.
4. Disconnect the booster hoses: the front one - from the high pressure pipe, the rear one – from the steering mechanism connection.
5. Remove cover 5 (see Fig. 65) of the oil tank, filter 2, and wash the filter.
6. Drain oil from the steering booster, for this purpose turn the steerable wheels to the left as far as they will go.
7. Connect the booster hoses to the steering mechanism piping.
8. Remove the remaining oil out of the pump tank, refit the gauze filter and tank cover.
9. Wash the hydraulic system, for this purpose:
 - fill 1.5 l of pure oil in the tank;
 - start the engine, and add oil up to the upper mark of the measuring rule, then under no-load conditions turn the steerable wheels either side as far as they will go (two or three times)

with the engine running idling; and set the wheels in the extreme right-hand position; furthermore perform work as per items 4, 6, 7.

10. Fill oil in the hydraulic system as follows:

- fill 1,5 l of pure oil in the tank;
- start the engine and add oil up to the upper mark; then, when the engine runs idling, bleed air out of the hydraulic system by turning the steering wheel either side as far as it will go (till air stops bubbling in the tank);
- stop the engine;
- check the oil level in the tank and add it if need be;
- fit the filler plug of the tank back.

5.4.2.3 Testing for free wheeling. Angular play of the steering wheel should be checked, rocking the steering wheel to this and that side till the steerable wheels begin to turn.

Angular play of the steering wheel should be checked on a completely equipped truck when the engine runs idling. The truck should be placed on an even ground with dry, hard surface (asphalt, concrete). The steerable wheels position must correspond to the straightforward travel of the truck, the steering hydraulic system should be filled, and air evacuated out of the working fluid.

Angular play of the steering wheel should not exceed 25° (12° for a new truck).

If the free wheeling exceeds this value and clearances in steering gear elements are eliminated, adjust the steering unit engagement. Drain oil from the unit before adjusting it.

5.4.2.4 Steering unit engagement adjustment. Adjust the tightness in the bearings 14 (Fig. 61), and the clearance between the nut-rod 8 and the sector 1.

The threaded joint (the screw 7, the balls 6 and the nut-rod 8) and the distributor unit cannot be adjusted during operation. Do not disarrange the set of these parts.

1. Prior to adjusting the tightness in the bearings 14 fix the steering unit in the jaws taking it by the gear case eyes, disconnect the universal joint. Rotate the shaft 15 (see Fig. 62), fix the nut-rod 8 (see fig. 61) and the sector 1 in one of the outmost positions. Determine the torque necessary to crank the shaft 15 (see Fig. 62) from the outmost position to the middle one (crank the shaft with the angle 30°). If the torque is less than 0.9 N.m (0.1 kgf.m), adjust the tightness in the bearings 14 (see Fig. 61), by decreasing the number of the gaskets 12. After the adjustment the torque necessary for cranking the shaft 15 (see Fig. 62) should be in the range 0.9-1.5 N.m (0.1-0.15 kgf.m).

2. To check the clearance in the gear engagement, rotate the shaft 15 and fix the nut-rod and the gear sector in the middle position (divide the full number of the shaft 15 rpm by two).

Check the clearance by rocking the drop arms in both directions (there will be slight rattle heard in the gear engagement) or by rotating the shaft 15 to the left and to the right before twisting the torsion bar 17 with the fixed sector. To adjust the gear engagement, remove the drop arm, the cap 19 (see Fig. 61) and the cap 22. Turn the collar steps 21 with the bearings 18 clockwise (if seen from the sector shaft side) by the same angle to eliminate the clearance in the gear engagement. After the collar steps are turned, one of the holes in them should be in the cavity which lays in the located diametrically threaded holes in the case 9 for the caps 19 and 22 fixations. Place the caps so that the locks 10 enter the holes in the collar steps 21 and are located opposite each other. If there is a small misalignment of the locks and the holes, turn the collar steps in either direction until they align paying attention that there is no clearance in the gear engagement. After the adjustment the caps 19 and 22 can be turned by 90° , 180° and 270° in comparison with the initial position.

The tightening torque necessary for cranking the shaft 15 (see Fig. 62) in the middle position is to be 2.7-4.1 N.m (0.27-0.41 kgf.m).

5.4.2.5 Adjusting the front wheel toe-in. For checking the toe-in of the front wheels, see that the tires have been inflated to the rated pressure and measure difference in distance B1 and B (Fig. 67) across the wheel rims. For checking follow this procedure:

- place the truck on an even hardly-paved horizontal site so that the front wheels are positioned for the straightforward travel of the truck;
- using a measuring rule, check distance B1 between the wheel rim beads in the rear section at the level of wheel centers and mark these points. Roll the truck, so that these marks are in front and check distance B. In front the distance must be 1-3 mm less than that in the rear. If the difference of the distances measured between B1 and B is beyond the limits, readjust by changing the length of the lateral steering rod after slackening the bolts on the lateral steering rod ends. Upon readjusting the toe-in, tighten the rod end bolts. Angles of turn are limited by non-adjustable thrusts.

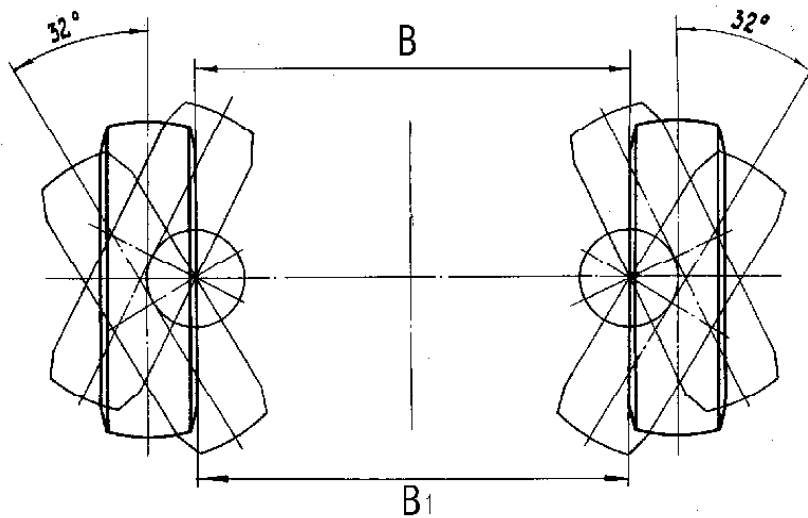


Fig. 67 - Steerable Wheels Position

5.5 Brake Systems

The brake system is designed to reduce speed and stop the truck or ensure the truck immobility during parking.

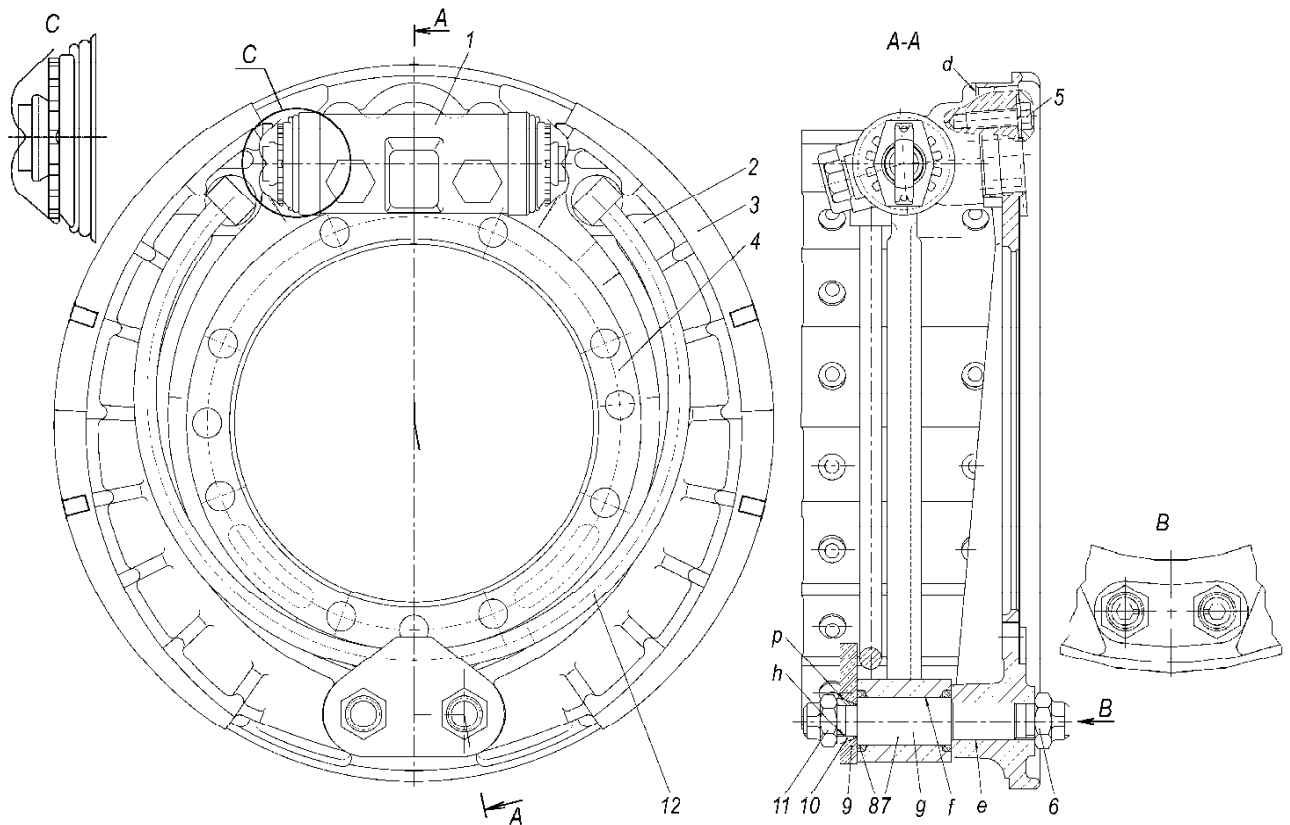
The truck is equipped with brake systems: service, stand-by, parking and trailer brakes control in accordance with UNECE Regulations №13.

5.5.1 Service brake system

The service brake system should ensure speed reduction and the truck stopping irrespective of its speed, load and road slopes, which it is designed to.

The drive of the brake gears is pneumatic, two-circuit, with separate braking of the front axle wheels and those of the rear axles (rear bogie). The brakes are controlled by the pedal in the driver's cab, connected with the double-unit brake valve by levers and tie rods.

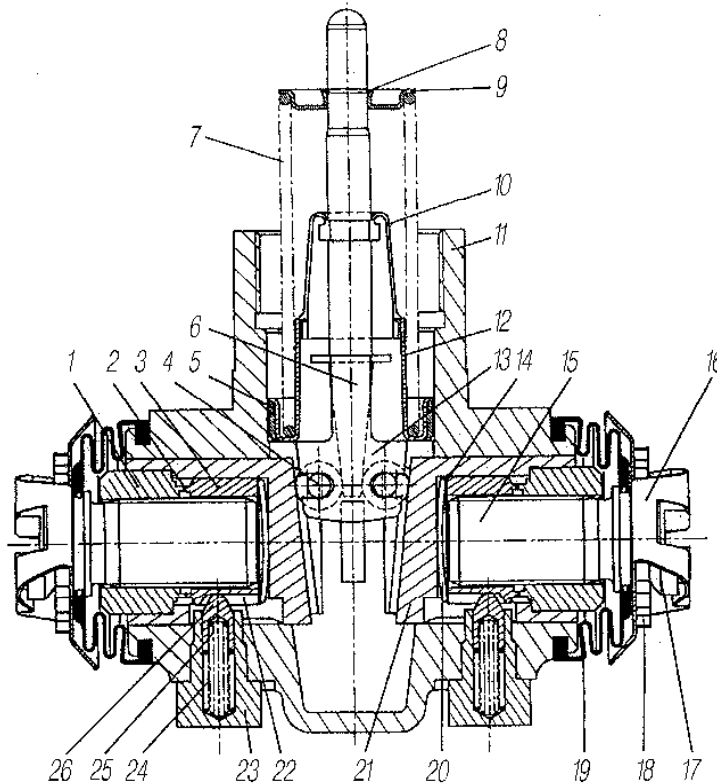
The service brake mechanism is drum-type with the internal brake shoes 2 (Fig. 68). Every brake mechanism has a wedge mechanism 1 with automatic adjustment between the lining 3 and a drum. Brake shoes are installed on the axles 7.



1-wedge mechanism; 2-brake shoe; 3-brake (friction) lining; 4-brake support; 5-bolt; 6, 11-nuts; 7-brake shoe axle; 8-ring; 9-brake shoe axle lining; 10-expandingr sleeve; 12-brake shoe spring; d, e, f, g, h, p-surfaces

Fig. 68 - Service Brake Mechanism

5.5.1.1 Wedge mechanism is shown in Fig. 69.



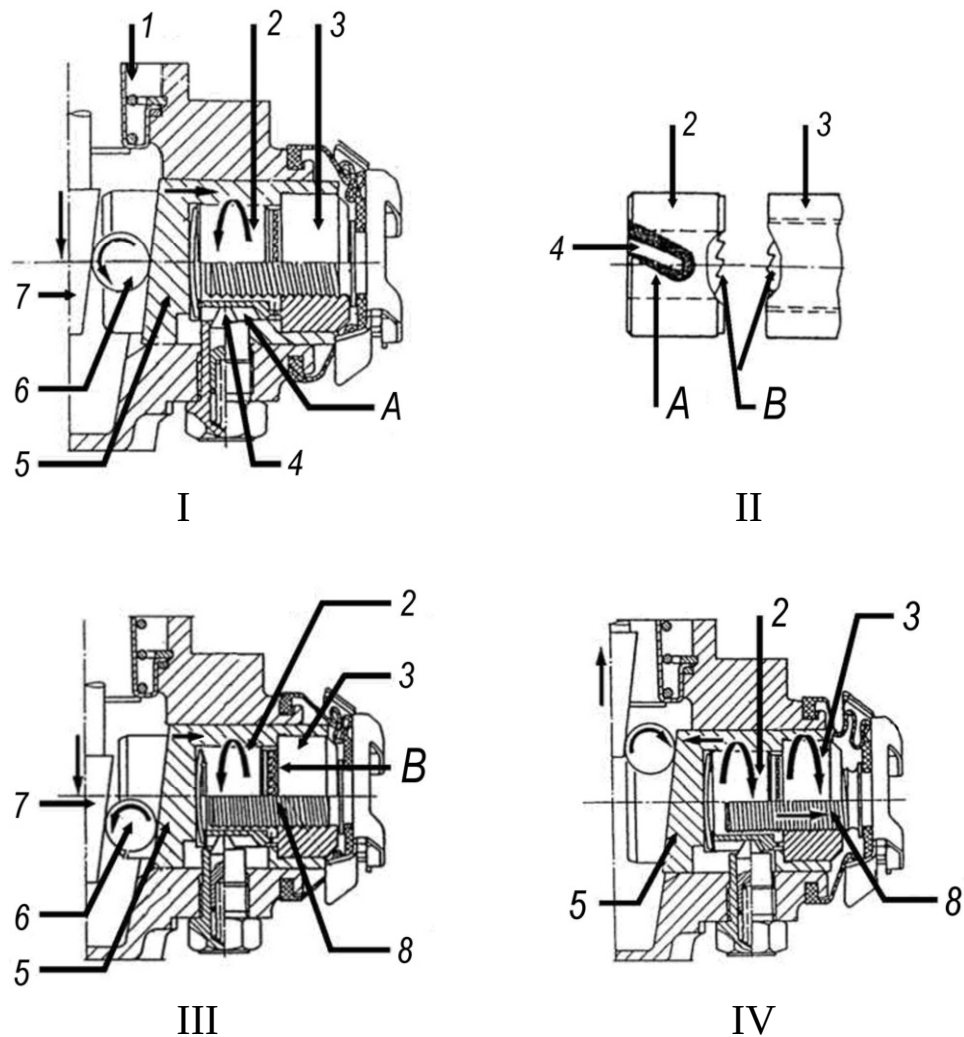
1-adjusting nut; 2-toothed coupling; 3-adjusting ring; 4-roller; 5-O-ring; 6-cleat wedge; 7-release spring; 8-locking ring; 9, 12-spring cap; 10-cartridge; 11-housing; 13-roller cage; 14-washer; 15-adjusting bolt; 16-leaf spring; 17-globe joint dome; 18-toothed wheel; 19-protective collar; 20-spiral spring; 21-pistons; 22-spiral groove; 23-shoulder screw; 24-compression spring (a short one); 25- compression spring (a long one); 26-pin

Fig. 69 – Wedge release mechanism

5.5.1.2 Wedge mechanism automatic adjustment. For every piston of the wedge mechanism, an automatic adjuster is provided in order to ensure constant control over the clearance between the brake drum and the brake linings.

When applying the brake, the cleat wedge 7 (Fig.70), overcoming the resistance of the release spring 1, presses the rollers 6 which turn over in downward direction on the cleat wedge surface 7 and piston 5. At this, piston 5 with a toothed ring 2 and adjusting nut 3 moves outwards — and the braking process begins. Due to the piston 5 lengthwise displacement, a special sprung pin 4 thrusts into the toothed ring 2 via the spiral groove «A», and turns it over so that the rotation extent of the latter depends directly on the piston 5 stroke.

When braking is stopped, the whole mechanism is back to initial state.



- I - wedge mechanism;
- II - toothed mechanism;
- III - automatic adjustment initial stage;
- IV - automatic adjustment final stage.

1-release spring; 2-toothed ring; 3-adjusting nut; 4-pin; 5-piston; 6-roller; 7-cleat wedge; 8-adjusting bolt; A-spiral groove; B-toothed coupling

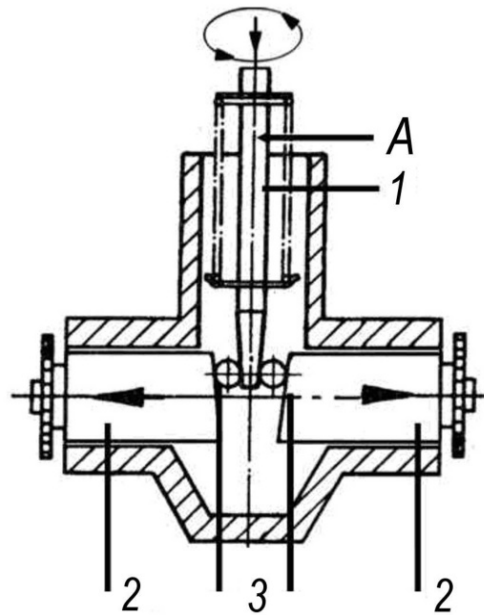
Fig. 70 – Wedge mechanism automatic adjustment

At the increased clearance due to the brake linings wear, the cleat wedge 7 is pressed further downwards and the pistons 5 stroke increases. When the toothed ring 2 turn through exceeds the toothed coupling «B» tooth pitch between the toothed ring 2 and adjusting nut 3, the automatic adjustment is carried out: the toothed coupling jumps over one tooth, and adjusting nut 3 and bolt 8 do not turn through.

At the brake release, the bolt 8, adjusting nut 3, toothed ring 2 and pistons 5 are forced inwards. As the pin 4 thrusts into the spiral groove «A», adjusting nut 3 and toothed ring 2 turn through by one pitch of the toothed coupling. The adjusting nut 3 by means of the thread, shifts the bolt 8 out, thus reducing the backlash formed as a result of the brake lining wear.

By means of the toothed connection «B», the adjustment is carried out with a very short stroke, evenly, the stroke is being 0,03 mm.

5.5.1.3 Wedge mechanism mounting. When mounting a wedge mechanism, stick to the following rule: the free end of the cleat wedge 1 (Fig. 71) is to be located inside the housing strictly along axis A without warps. The warp can cause the installed wedge damage.



1-cleat wedge; 2-pistons; 3-rollers

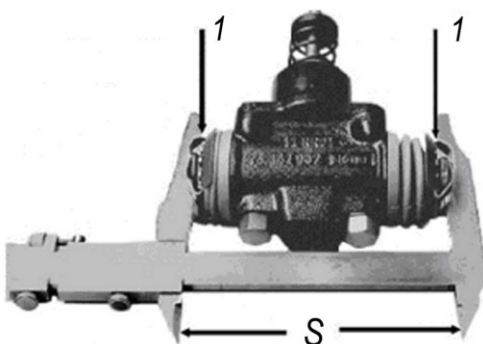
Figure 71 – Cleat Wedge Installation

When assembling the unit, observe the following strictly: insert the wedge 1 into the housing in the direction indicated with an arrow. **In doing so rollers 3 should face the pistons 2.**

Installation verification: push the wedge by hand and try to rotate it. If the wedge goes down, it means that rollers fail to be placed between pistons correctly.

During wedge mechanism mounting, check that cleat wedge assy preserves the correct position.

During wedge mechanism assembly, the distance «S» between bearing surfaces for the brake shoes should correspond to the Fig. 72



1-adjusting bolt; S-165 mm

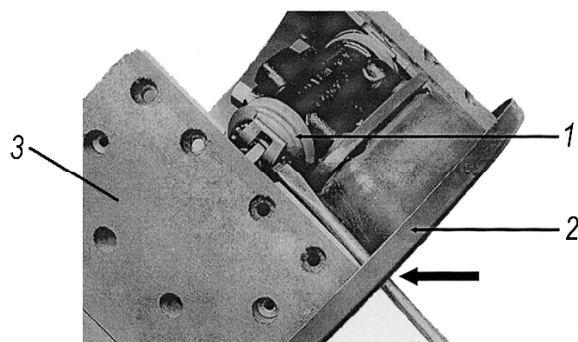
Figure 72 – Adjustment During Mechanism Assembly

Adjust the distance «S» in the following way: turn in the adjusting bolt 8 (Fig. 70) with an effort till the click is heard when the teeth of coupling «B» jump between the toothed ring 2 and adjusting nut 3; **then unscrew bolt 8 by one turn.**

Lubricate all inner parts of the wedge mechanism while assembly. Prior to cleat wedge 6 (Fig. 69) mounting, pack 22-25 cm³ of grease into the mechanism and fill the hollow under the protective collars 19 with the lubricant.

The wedge mechanism is lubricated with DEA-PARAGON EP2 lubricant.

5.5.1.4 Removing the brake drum with wheel hub. If the brake lining cuts into the brake drum surface preventing its removal due to the edge, and the working stroke is not enough to withdraw them on sufficient distance, the brake shoes are to be withdrawn manually using the screwdriver (see the Operation manual, Appendix 3 «Spare parts, tools and accessories»). Via the openings (indicated with an arrow) in support 2 (Fig. 73), the toothed wheels 1 turn over till the brake drum with wheel hub removal is possible.



1-toothed wheel; 2-support; 3-brake shoe

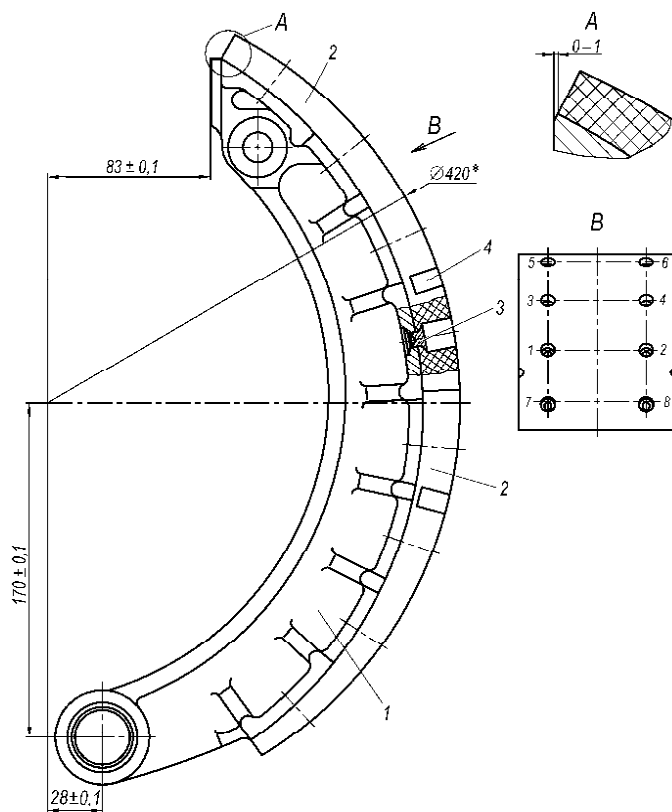
Fig. 73 – Brake shoe manual withdrawal

5.5.1.5 Brake linings replacement. If the brake linings have worn down, replace them as per Fig. 74. The linings wear rate is determined by means of the wear indicator. In order to ensure snug engagement of the brake lining to the brake shoe, it is recommended to rivet the rivets from the central openings of the brake lining as shown at view B (1-2, 3-4, 5-6, 7-8).

If the linings are oiled, rinse them with gasoline.

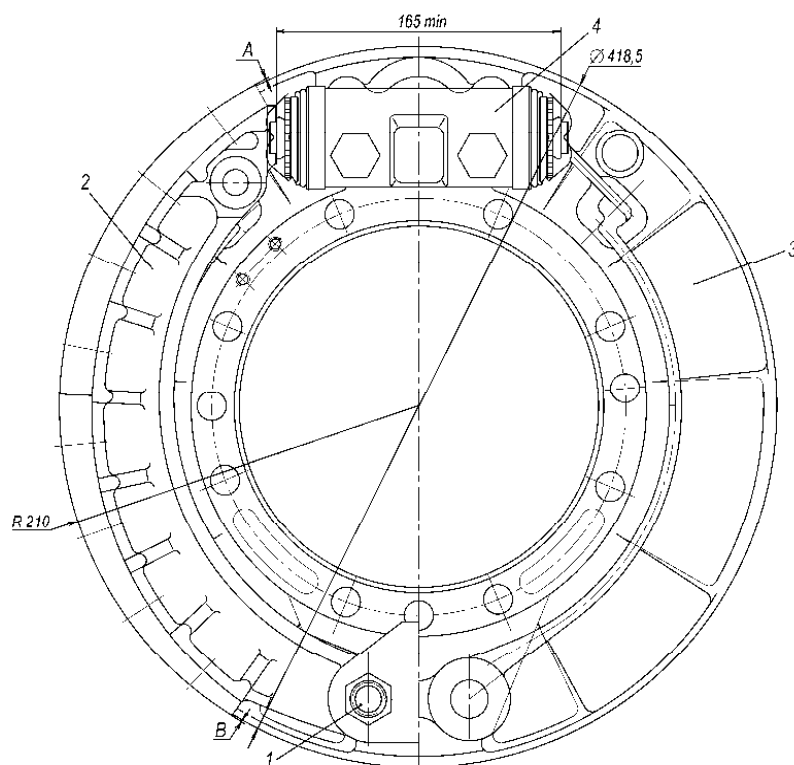
5.5.1.6 Service brake adjustment after replacing the brake friction linings or brake shoes

During the service brake assembly (Fig. 75) the shoe pins 1 should be set so that the marks on the ends face each other first, brake shoes with brake linings 2 should be installed with dimension of $166^{+0,2}$ mm between the thrust surfaces, in accordance with Fig. 74; the wedge mechanism should be mounted in accordance with Fig. 72 and 68 (view C). The distance between the support outer diameter M and the brake linings (A and B) should not exceed 0,75 mm, the difference between the distances A and B should not exceed 0,2 mm. If the difference between the distances A and B exceeds the allowable value, it is to be adjusted by means of the brake shoe pins.



1-brake shoe; 2-brake lining; 3- rivet; 4- wear indicator; *-diameter without taking into account brake drum wear

Fig. 74 – Brake linings rework diagram



1-brake shoe pins; 2-brake shoe with brake linings; 3-support; 4-wedge mechanism; A, B-distance between the support external diameter and brake linings

Fig. 75 – Adjustment scheme for brake shoes with brake linings

In accordance with the Fig. 68:

- torque the bolt 5 to the 75-85 Nm (7,5-8,5 kgf m). Apply AMC-3 GOST 2712-75 lubricant on the «d» surface;

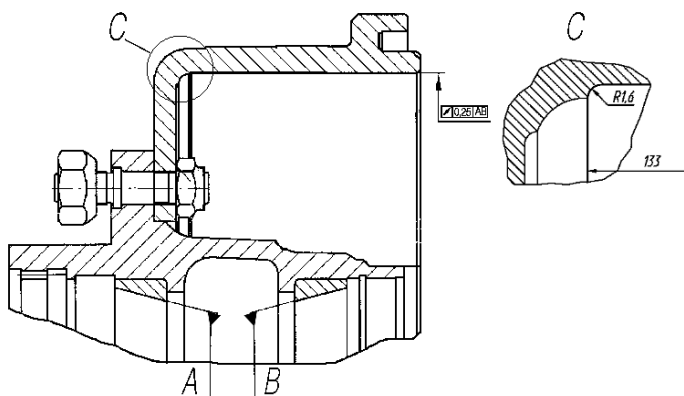
- before assembly, the brake shoe surface «g» of the axle 7 and surface «f» lubricate with graphite grease as per GOST 3333-80. Apply the lubricant AMC-3 GOST 2712-75 on the surfaces «e», «h» and «p».

The brake shoe axle nuts tightening order: first tighten the nut 6 with a tightening torque of 431-490 Nm (44-50 kgf m), then the nut 11 with a tightening torque of 274-313 Nm (28-32 kgf.m).

At the brake drum wear, and at the presence of circular grooves with the depth of 1 mm, the drum working surface is to be turned in accordance with the Table 5, basing on the hub bearings outer rings, according to the Fig. 76. The drum working surface run out should not exceed 0,25 mm.

Table 5- **Brake drum inner surface diameter after internal turning**

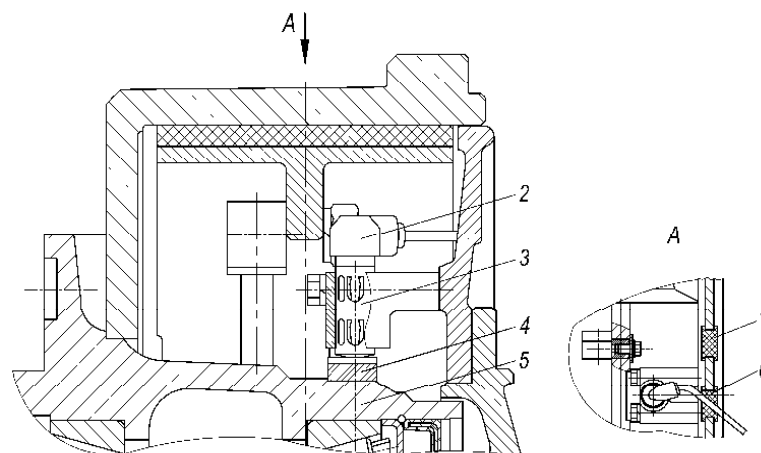
Diameter after the first internal turning, mm	Diameter after the second internal turning, mm	Max internal turning diameter, mm
421,5	423	424,38



A,B-reference surfaces

Fig. 76 – Brake drum rework diagram

5.5.1.7 Rotation sensor. Front and rear wheels brake mechanisms have inductive pickups 2 (Fig. 77).



1-plug; 2-inductive pickup; 3-clamping sleeve; 4-toothed impulse ring; 5-wheel hub; 6-rubber bushing

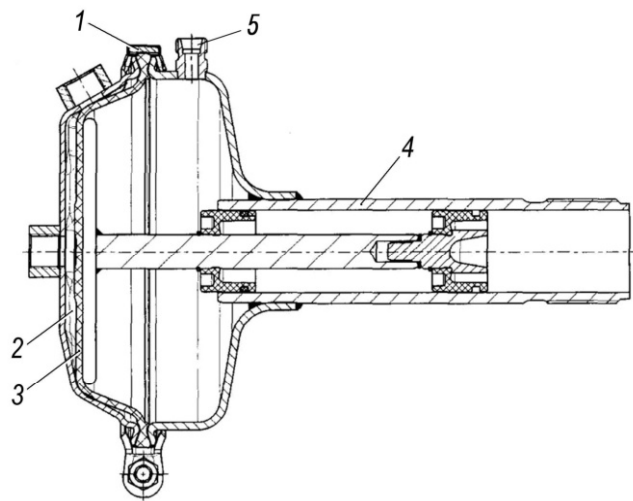
Fig. 77 - Rotation sensor

Before installing the hub with a brake drum, it is necessary to recess the inductive pickup 2 (from the center) in order to avoid its damage. After that, without applying excessive force, make the pickup go till it thrusts into the impulse ring.

The inductive pickup 2 consists of the permanent magnet with round bar and coil. The impulse toothed ring rotation induces voltage pulses in the pickup coil; the voltage pulses frequency is proportional to the wheel rotation speed. The pickup is secured in the special bushing.

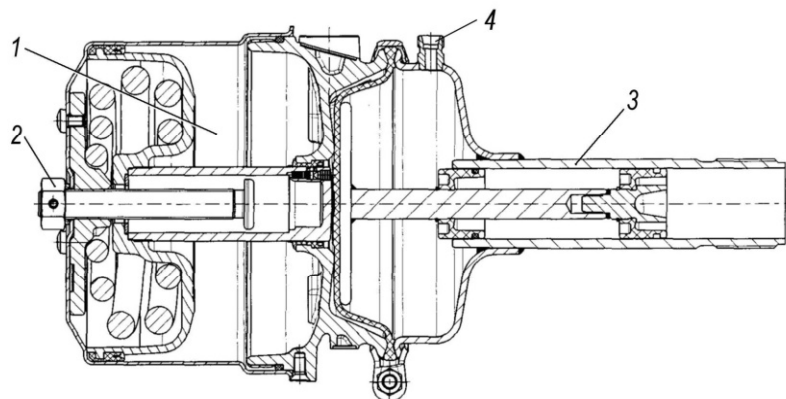
Angular velocity sensors are of individual type; installed in the front and rear axle wheels; working with impulse toothed ring pressed onto the hub 5 and are used for the wheel speed continuous reading off. The received signal is transferred to the control unit via cables. For the sensor normal operation, the clearance between the rotor and the sensor should not exceed 0,7 mm.

5.5.1.8 Brake chambers. The brake chambers installed on the trucks are shown in Fig. 78, 79.



1-band; 2-cavity; 3- membrane; 4-pipe; 5-sealing connection

Fig. 78 – Brake chamber

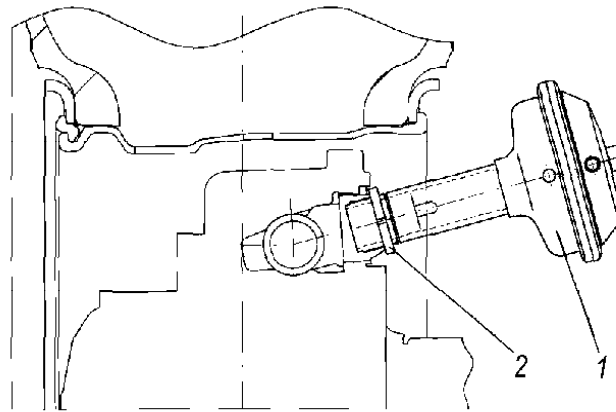


1-spring brake; 2-unbraking screw; 3-pipe; 4-sealing connection

Fig. 79 - Brake chamber with spring brake

Brake chambers installation is shown in Fig. 80, 81.

The brake chamber 1 installation depth (Fig. 80) is 25 mm. It is twisted in as far as it will go and then it is turned inversely till the system pneumatic outputs are directed backwards. For the connection tightness, use silicone-or rubber-based sealant. Tighten the lock nut 2 with a tightening torque 300 ± 20 Nm (30 ± 2 kgf m) by means of the locknut wrench KK 2327.



1-brake chamber; 2-nut

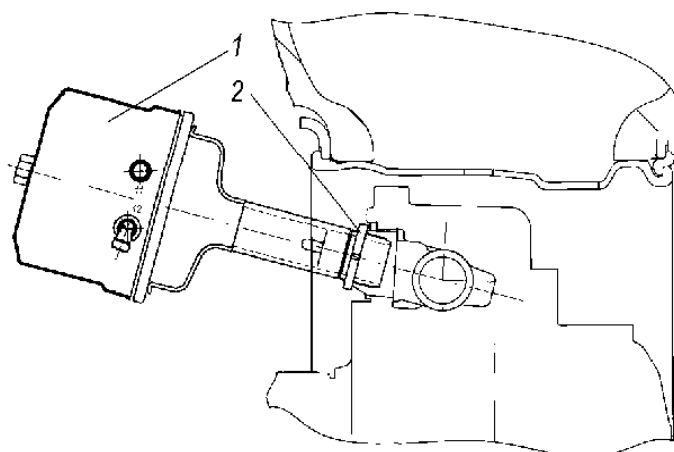
Fig. 80 - Brake chamber installation

Install the brake chambers with spring brake in accordance with Fig. 81:

- install the chamber as far as it will go (installation depth is 25 mm);
- turn it inversely till the outputs 11, 12 are directed backwards;
- tighten the lock nut 2 with a tightening torque 300 ± 20 Nm (30 ± 2 kgf m).

The brake chamber and wedge mechanism connection is to be sealed in using silicone-or rubber-based sealant.

The wedge mechanism and brake chambers check for damage and wear should be done not later than after two years from the commencement of operation. Replace the damaged units. Immediately replace the rubber parts in case of their damage.



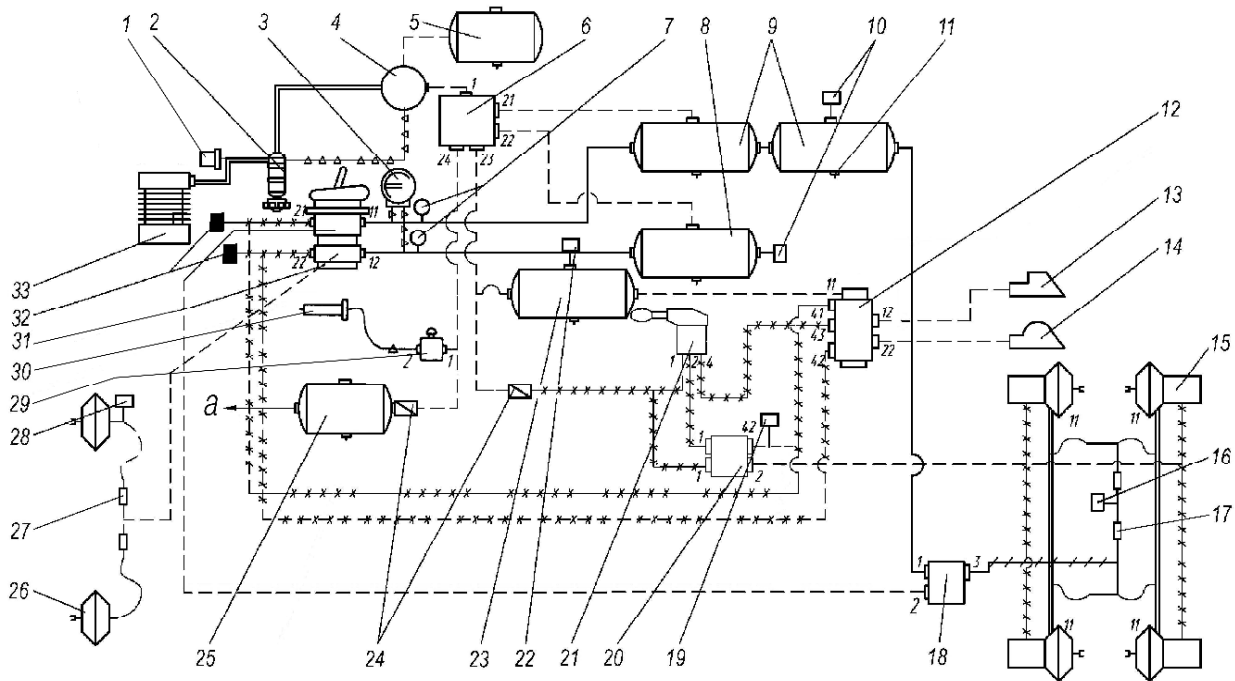
1-brake chambers with spring brake; 2-nut

Fig. 81 – Installation of brake chamber with spring brake

5.5.1.9 Brake system tightness. The tightness system is provided for in the brake chambers. Sealing connection 5, according to Fig. 78, and sealing connection 4, according to Fig. 79, are connected with pipeline set to the sidemember level.

5.5.2 Pneumatic Drive of the Service Brakes

The schematic diagram of the brake drive with outlets to the 6x6 truck trailer is shown in Fig. 82.



1-towing device; 2-oil separator; 3-two-pointer gauge; 4-pressure regulator with adsorber; 5-adsorber reservoir; 6-four-line safety valve; 7-pressure drop sensor; 8-front axle brakes' air reservoir; 9-rear bogie brakes' air reservoirs; 10, 16, 19, 22, 28-check outlet valves; 11-condensate drain cock; 12-trailer brake with break-away valve; 13-feeding coupling head; 14-control coupling head; 15-brake chambers with spring brake; 17, 27-ABS modulators; 18-service brake acceleration valves; 20-parking brake acceleration valve; 21-parking brake valve; 23-trailer and parking brake cylinder; 24-return valve; 25-non-brake consumers air reservoir; 26-brake chambers; 29-parking brake air valve; 30-pneumatic cylinder of engine stop; 31-brake valve; 32-brake actuation sensor; 33-compressor; a-to air-hydraulic booster (AHB)

Fig. 82 - Brake Pneumatic Drive Diagram with outlets to the 6x6 truck trailer

Compressed air from the compressor enters the oil separator 2, pressure regulator 2 with adsorber 4, four-line safety valve 6 and adsorber reservoir 5. The air is cleared of moisture, oil, after which the air is distributed along the contours:

- the first main circuit consists of an air cylinder 8, the lower section of the brake valve 31, modulators 27, brake chambers 26.
- the second circuit consists of air cylinders 9, the upper section of the brake valve 31, service brake acceleration valves 18, spring brake chambers 15, modulators 17.
- the third circuit consists of air cylinder 23, trailer brake with break-away valve 12 with double-line drive, feeding coupling heads 13, control coupling heads 14 for connecting trailers with brake double line drive.

Pressing the brake pedal engages the first and the second circuits of the truck brake drive as well as the third circuit of the trailer brake drive.

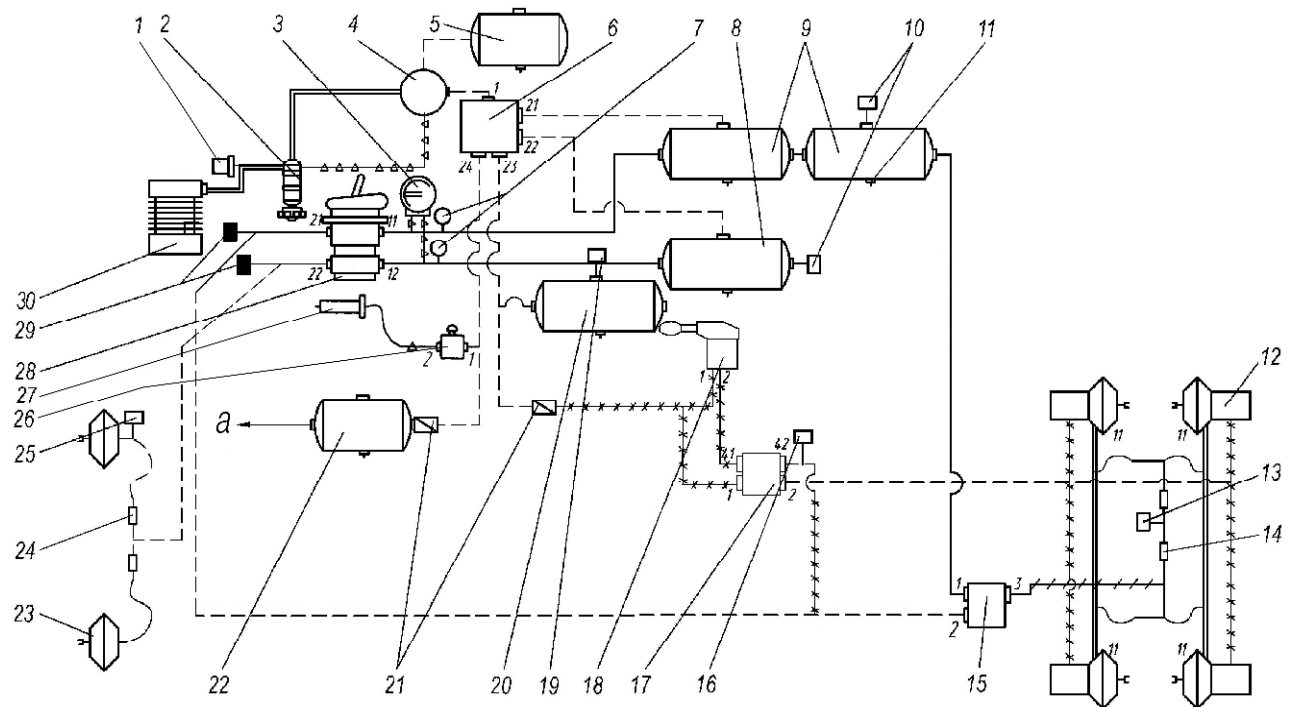
If one of the circuits is out of order, the rest remain efficient.

For the system diagnostics the check outlet valves are installed in each circuit.

Condensate drain valves are provided to service air bottles.

The brakes pneumatic drive units serve to create a compressed air reserve on the truck and to actuate the brakes of the truck and of the trailer.

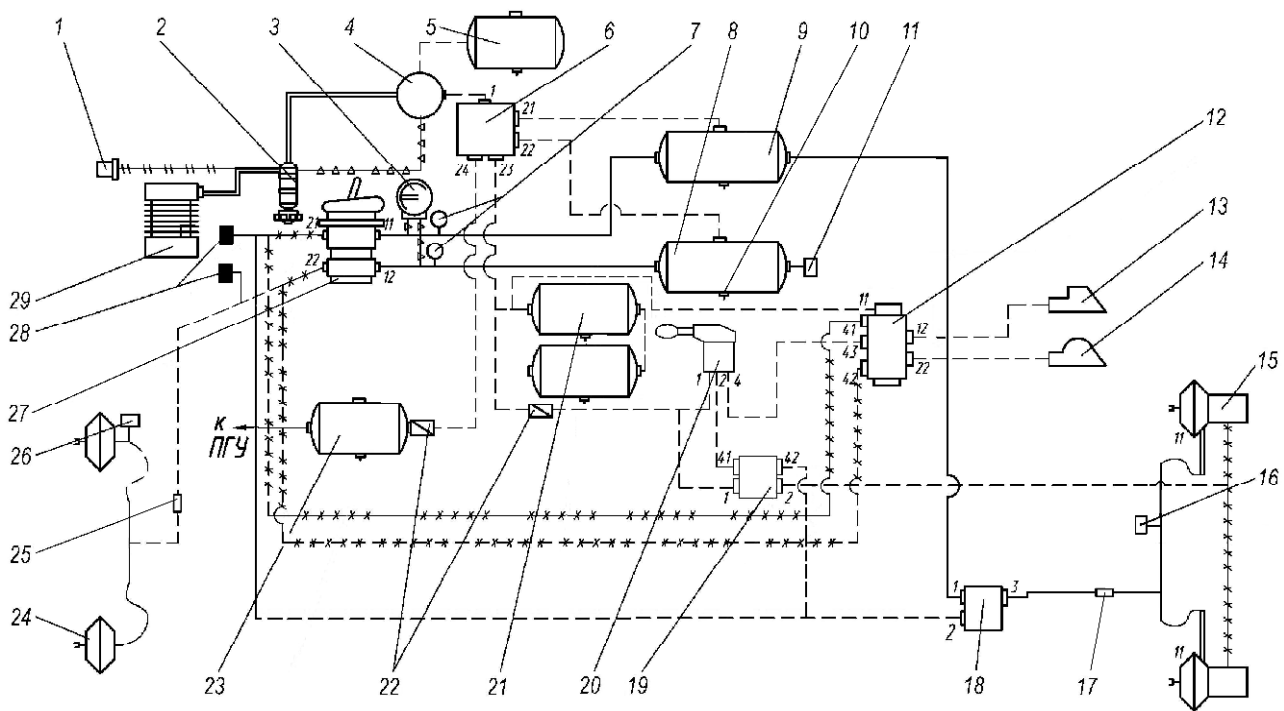
The schematic diagram of the brake drive without outlets to the 6x6 truck trailer is shown in Fig. 83.



1-towing device; 2-oil separator; 3-two-pointer gauge; 4-pressure regulator with adsorber; 5-adsorber reservoir; 6-four-line safety valve; 7-pressure drop sensor; 8-front axle brakes' air reservoir; 9-rear bogie brakes' air reservoirs; 10, 13, 16, 19, 25-check outlet valves; 11-condensate drain cock; 12-spring brake chambers with spring brake; 14,24-ABS modulators; 15-service brake acceleration valve; 17-parking brake acceleration valve; 18-parking brake valve; 20-parking brake system cylinder; 21-return valve; 22-non-brake consumers air reservoir; 23-brake chambers; 26-parking brake air valve; 27-engine stop pneumatic cylinder; 28-brake valve; 29-brake actuation sensor; 30-compressor; a-to air-hydraulic booster (AHB)

Fig. 83 - Schematic diagram of the brake drive without outlets to the 6x6 truck trailer

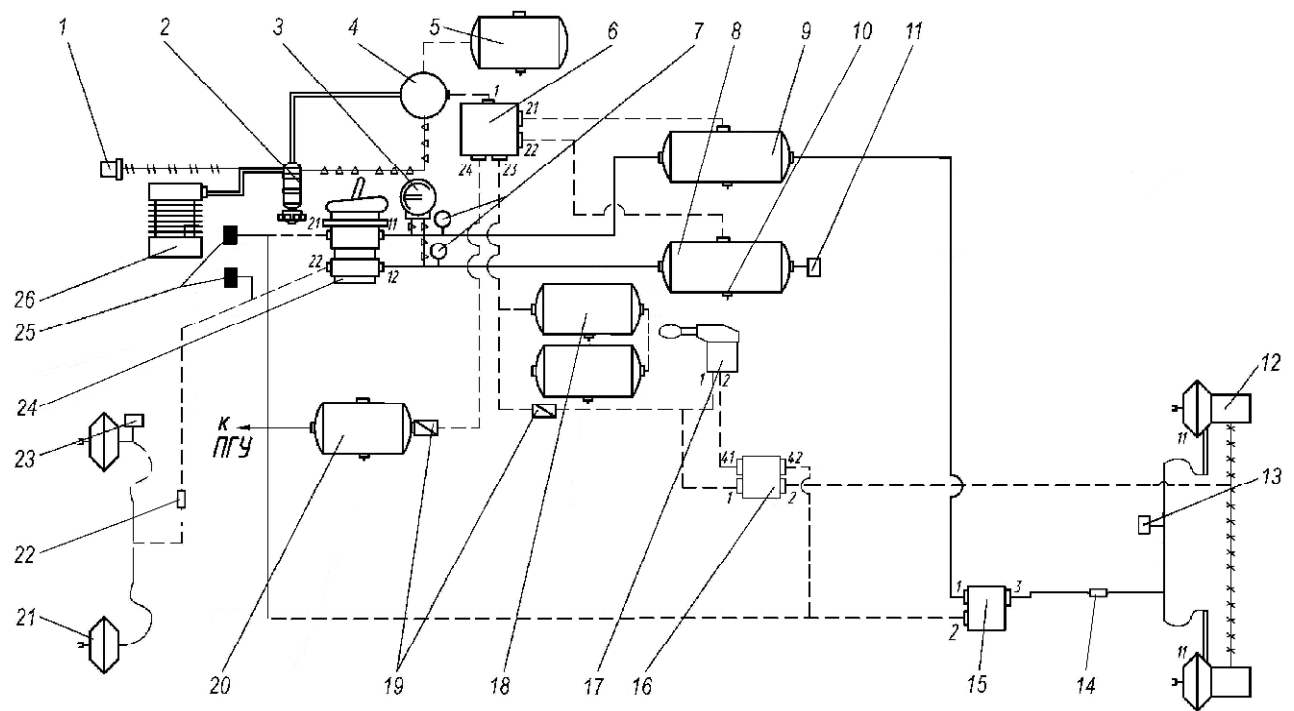
The schematic diagram of the brake drive with outlets to the 4x4 truck trailer is shown in Fig. 84.



1-towing device; 2-oil separator; 3-two-pointer gauge; 4-pressure regulator with adsorber; 5- adsorber reservoir; 6-four-line safety valve; 7-pressure drop sensor; 8-front axle brakes' air reservoir; 9-rear axle brakes' air reservoirs; 10-condensate drain cock; 11, 16, 26-check outlet valves; 12-trailer brake with break-away valve; 13-feeding coupling head; 14-control coupling head; 15-spring brake chambers with spring brake; 17, 25-ABS modulators; 18-service brake acceleration valves; 19-parking brake acceleration valve; 20-parking brake valve; 21-trailer and parking brake cylinder; 22-return valve; 23-non-brake consumers air reservoir; 24-brake chambers; 27-brake valve; 28-brake actuation sensor; 29-compressor

Fig. 84 - Schematic diagram of the brake drive with outlets to the 4x4 truck trailer

The schematic diagram of the brake drive without outlets to the 4x4 truck trailer is shown in Fig. 85.



1-towing device; 2-oil separator; 3-two-pointer pressure gauge; 4-pressure regulator with adsorber; 5-adsorber reservoir; 6-four-line safety valve; 7-pressure drop sensor; 8-front axle brakes' air reservoir; 9-rear axle brakes' air reservoirs; 10-condensate drain cock; 11, 13, 23-check outlet valves; 12-brake chambers with spring brake; 14, 22-ABS modulators; 15-service brake acceleration valves; 16-parking brake acceleration valve; 17-parking brake valve; 18-parking brake air cylinder; 19-return valve; 20-non-brake consumers air reservoir; 21-brake chambers; 24-brake valve; 25-brake actuation sensor; 26-compressor

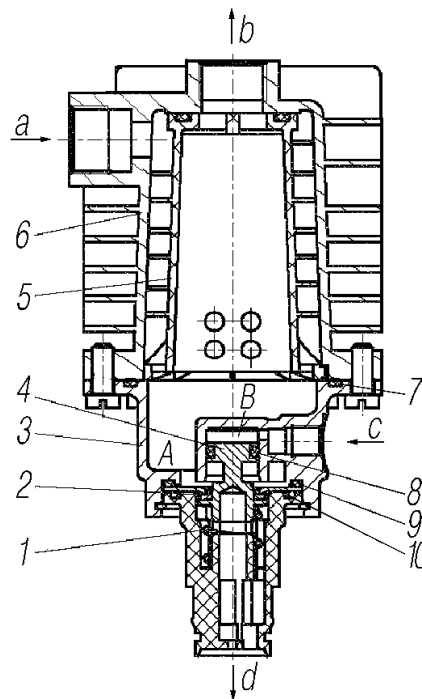
Fig. 85 - Schematic diagram of the brake drive without outlets to the 4x4 truck trailer

Legend to Fig. 82-85:

- ▲▲▲— - polyamide tube Ø 6 mm;
- ×××— - polyamide tube Ø 8 mm;
- — — - polyamide tube Ø 10 mm;
- // — - polyamide tube Ø 12 mm;
- — — - polyamide tube Ø 14 mm;
- — — - polyamide tube Ø 15 mm;
- ~~~~~ - rubber hose

5.5.2.1 Compressor. The compressor operation and maintenance should be done according to Operation Manual for the “YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units”, Addendum «YAMZ-6565, YAMZ-65651, YAMZ-65652, YAMZ-65653, YAMZ-65654 Engines and their package» to the Operation Manual «YAMZ-236HE2, YAMZ-236HE, YAMZ-236H, YAMZ-236BE2, YAMZ-236BE, YAMZ-236B Power Units ».

5.5.2.2 Oil Separator (Fig.86) is designed to clean the compressed air charged by the compressor, as well as to condense and remove moisture, oil and other contaminants contained in the air. The oil separator is installed in front of the pressure regulator and adsorber; it extends the life of the drying cartridge.



1-spring; 2-valve 3-lower part; 4-piston; 5-auger; 6-upper part; 7, 8, 9-packing rings; 10-valve seat; a, b, c, d-outlets

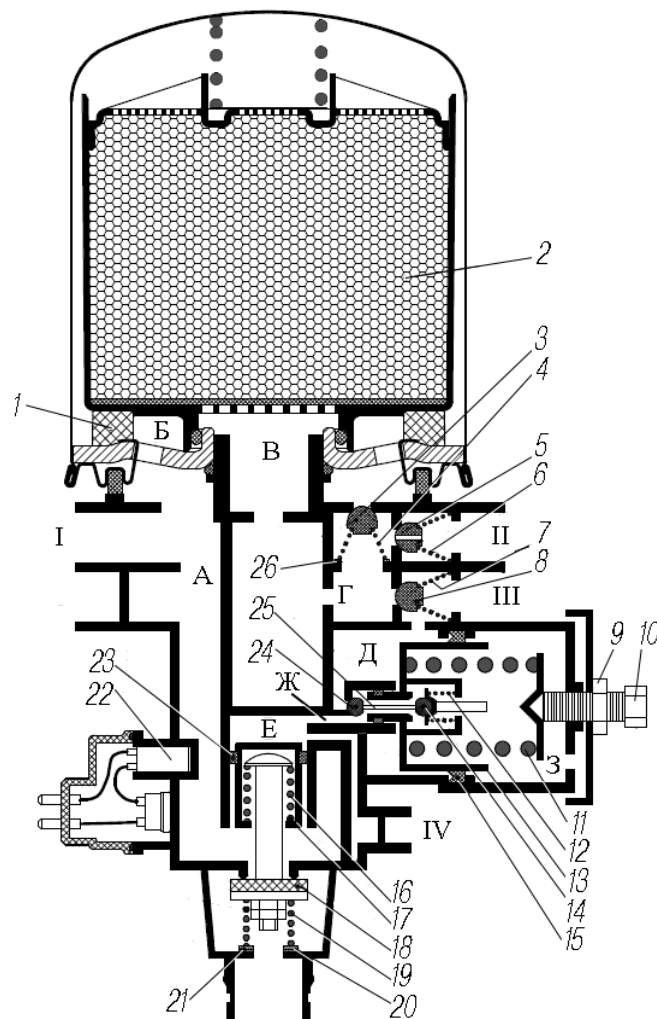
Fig.86 - Oil Separator

The compressed air is supplied from the compressor to the output «a» and at a high speed along the auger 5 spiral surface goes downwards along the inner side of the upper part 6. When passing the auger 5 spiral surface, the air cools down and a part of the water vapor contained in the air, is condensed therein and together with oil and other contaminants deposits on the wall of the upper part 6 and the spiral line, subsequently draining into the sink of the lower part 3. The purified air through the radial holes in the auger flows into the inner cavity of the auger and further to the output «b».

When the pressure governor is activated, the pressure is delivered to the cavity B via the output «d», which together with the working pressure in the cavity A acts on the piston 4 against the force of spring 1. The valve 2 opens and the collected oil and condensate pass to the atmosphere through the outlet «d».

5.5.2.3 Moisture-and-Oil Separator with Built-In Pressure Governor (Fig. 87) separates the condensate out of the compressed air and removes it from the feeding end of the drive.

The air delivered by the compressor goes to the outlet I of the unit and gets to the cavity A. Passing through the channel into the cavity B and further through the filter 1 to the upper part of the absorbent cartridge, the air is cleaned from oil, solid particles and condensed moisture. The compressed air is finally dried on passing through the absorbing element 2 with zeolite. The dried air goes into the cavity B and channel Γ.



1-filter; 2-zeolite; 3-by-pass valve; 4-by-pass valve spring; 5-throttle governor; 6-throttle governor spring; 7-return valve spring; 8-return valve; 9-nut; 10-adjusting screw; 11-balancing piston spring; 12-spring; 13-balancing piston; 14-relief valve; 15-cuff; 16-balance piston spring; 17-balance piston; 18-decompression pressure control valve; 19-decompression pressure control valve spring; 20, 21-adjusting disk; 22-discharge unit heater; 23-gasket; 24-inlet valve; 25-pusher; 26-adjusting disk; A, Б, В, Д, Е, 3- cavities; Г, Ж-channels; I-outlet from the compressor; II-outlet into the system; III-outlet to the regeneration reservoir; IV-control input/output

Fig.87 - Moisture-and-Oil Separator with Built-In Pressure Governor

Then, resisting the back pressure of the return valve 7 of the return valve 8, the compressed air is delivered to the outlet III, and after that to the truck brake system. Simultaneously, the compressed air, resisting the pressure of the spring 6 of the throttle governor 5 with a hole diameter of 1.5 mm, is delivered through the outlet II to the regeneration reservoir. At the same time, the compressed air flows into the cavity Д under the balancing piston 13, on which the spring 11 acts. When this happens, the relief valve 14, connecting the cavity E above the balance piston 17 with the environment via the channel Ж and cavity 3, is open. The inlet valve 24 under action of the pusher 25 and spring 12, is closed. Under the action of the spring 19, the decompression pressure control valve 18 is also closed. This condition of the moisture-and-oil separator with built-in pressure governor corresponds to the brake system receivers filling with compressed air from the compressor.

When the pressure in the cavity Д reaches the level of the cut-off pressure, the balancing piston 13 overcoming the force of the spring 11, moves to the right. Thus, the relief valve 14 is closed, the inlet valve 24 opens. The compressed air via the open inlet valve 24 from the cavity Д flows to the cavity E, balance piston 17 moves downwards, the decompression pressure control valve 18 opens and the compressed air from the compressor is released in the environment together with the condensate under the decompression pressure control valve 18 seat and the decompression pressure control valve itself. By this, the pressure in the channel Г and cavity B drops, the return valve 8 closes. As a result, the compressor operates in the discharge mode without the counterpressure.

Simultaneously, the throttle governor 5 closes. A dry air from the regeneration air cylinder through the throttling port diameter 1.5 mm of the throttle governor 5, channel Г, cavity B and the adsorbing cartridge, restoring the properties of the zeolite 2, goes into the atmosphere, simultaneously carrying away the drops of moisture, oil and dust particles deposited in the filter 1.

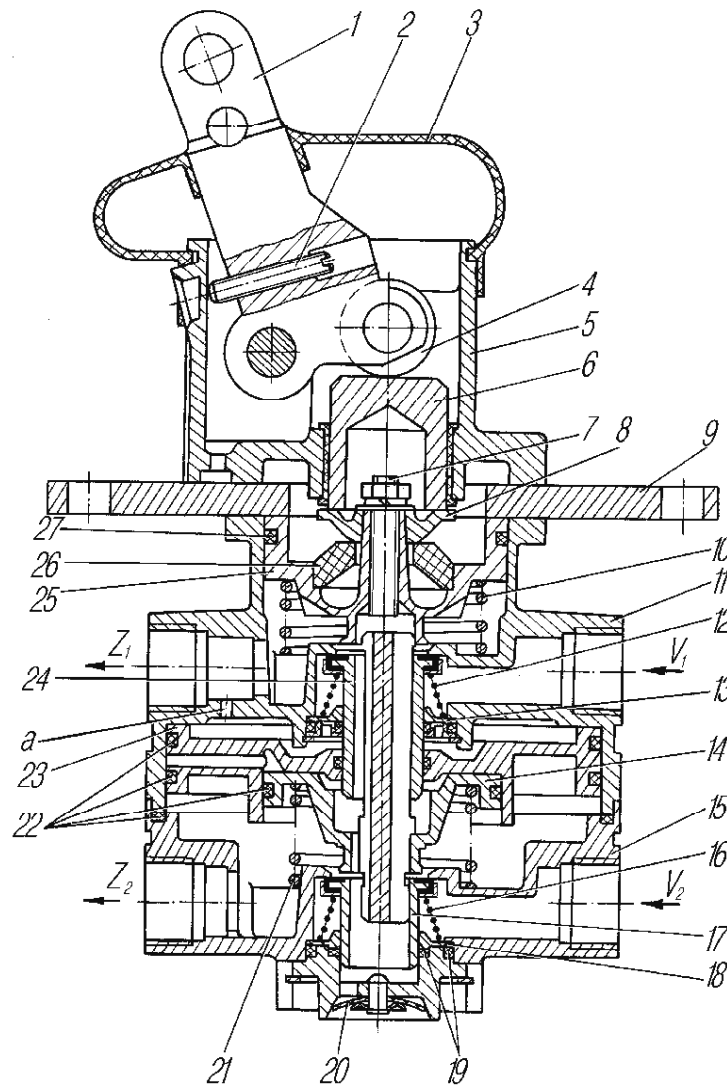
When the pressure drops (as a result of air output) in the output III down to the opening pressure, the balancing piston 13 under the action of spring 11 moves to the left. The inlet valve 24 closes, the relief valve 14 opens, communicating the cavity E with the environment through the channel Ж and cavity 3. At that, the decompression pressure control valve 18 closes under the action of the spring 19 and the compressor pumps in the compressed air into the system receivers again.

In addition, the decompression pressure control valve 18 works as a safety valve. If the built-in pressure governor does not work when the pressure is a cut-off one, then with the safety valve opening pressure, the decompression pressure control valve 18 opens overcoming the springs 19 and 14 force, and the air passes to the atmosphere. The safety valve opening pressure is regulated by the quantity of the adjusting disks 20, 21 under the decompression pressure control valve spring 19. The discharge unit heater built-in 22 prevents malfunction due to the possible freezing of condensate.

The moisture-and-oil separator design feature is that the decompression pressure control valve is placed in the direct flow of the warm compressed air supplied from the compressor. In case of malfunctions in the power supply circuit of the heater, after some time the warm air coming from the compressor warms up the discharge valve, it will return to its normal position and the pressure governor turns on the system filling up. In cases of excessive clogging or freezing of the moisture in the cartridge with an adsorbent due to improper use (continuous operation without regeneration, etc.) resulting in the stop the air passage through the adsorbing cartridge, the air supply to the pneumatic system is via the bypass valve 3 with a pressure drop of 0,15-0,24 MPa, which is optionally regulated by the adjusting disk 26 under the by-pass valve spring 4. In this case, the device provides a pressure control function only. This mode of the device operation is an emergency one allowed when it is impossible to replace the cartridge or restore its capacity on-site and when there is the urgent need to continue moving. A long operation of in this mode, especially at low temperatures, can lead to pneumatic system devices failure due to the condensate negative impact.

5.5.2.4 Two-section brake valve.

Two-section brake valve (Fig. 88), is designed to control the truck service brake system operation units and to control the trailer brakes drive valve.



1-lever; 2-stop screw; 3-protective cover; 4-roller; 5-lever housing; 6-pusher; 7-pin; 8-disk; 9-flange; 10, 12, 16, 21-spring; 11-upper part; 13, 18-carrier ring; 14-small piston; 15-lower part; 17-lower section valve; 19, 22, 27-sealing ring; 20-atmospheric outlet valve; 23-big piston; 24-upper section valve; 25-upper follow-up piston; 26-resilient member; Z₁-outlet to the air booster of the front axle brake contour; Z₂-outlet to the service brake system and to the air booster of the rear axle brake contour; V₁ and V₂-outlets to the air cylinders; a-opening

Fig. 88 - Two-section lever brake valve

Lever brake valve consists of the upper and lower parts. The valve lever mechanism is secured to the upper part. The lever housing is protected from dirt and moisture by means of boot. In the lower part 15 there is a small piston 14 which is by spring 21 is pressed to the big piston 23. Upper section valve 24 is pressed to the seat in the lower part by means of the spring 16.

Valve outlets V₁ and V₂ are connected with the air cylinders of two separate lines of the service brake drive. From the outlet Z₁ the compressed air flows to the front axle air booster and Z₂ – to the brake force regulator and to the rear axle air booster.

When depressing the brake pedal, the effort is transferred through the levers and drive rods system on the lever 1 of the valve and further via pusher 6, disk 8 and resilient member to follow-up piston 25. Lowering down, the piston 25 first closes the valve 24 outlet hole of the brake valve upper section, and then opens up the valve 24 from the seat in the upper part 11, opening the passage for the compressed air from the outlet V_1 to the outlet Z_1 and further to the operation units of one of the contours. The pressure in the outlet Z_1 increases till the effort of pressing on the lever 1 gets balanced by the force created by the pressure acting on the upper piston 25. Thus, the follow-up action in the brake valve upper section is carried out.

At the same time with the pressure increase in output Z_1 , the compressed air via opening «a» gets to the cavity above the big piston 23 of the brake valve lower section. Lowering down, the big piston closes the outlet of the valve 17 and separates it from the seat in the lower part 15. The compressed air from the outlet V_2 goes to the outlet Z_2 and further to the operation units of the second circuit of the service brake.

At the same time with the pressure increase in output Z_2 , the pressure under pistons 14 and 23 rises, as a result of which the force acting on piston 23 from above, gets balanced. Owing to this, the pressure is set in the outlet Z_2 , corresponding to the effort on the brake valve lever. Thus, the follow-up action in the brake valve lower section is carried out.

At the brake valve lower section failure, the upper section operates as described above.

Two-section brake valve maintenance consists in its periodical inspection, cleaning from dirt, checking for tightness.

Pay attention to the condition of the protective rubber boot of the valve and to its tight fitting to the housing, because dirt on the pusher and friction surfaces of the valve causes the brake valve failure.

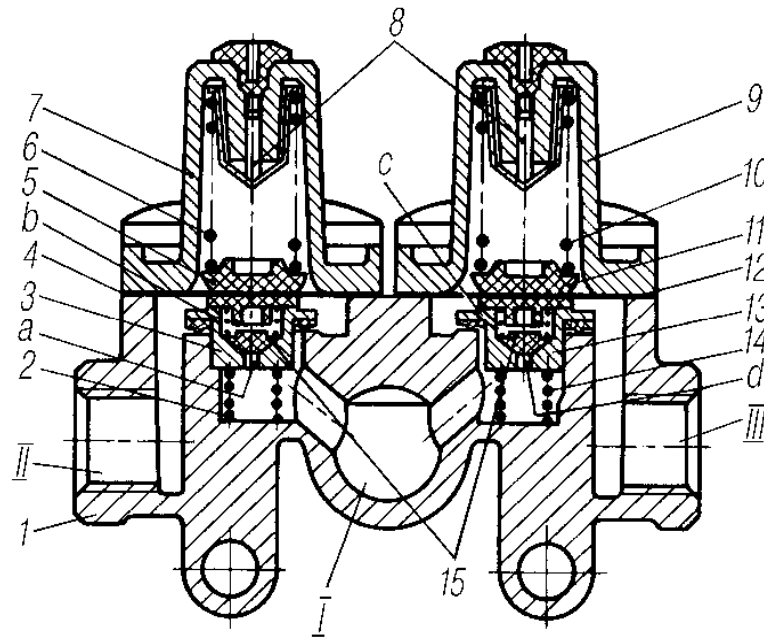
The brake valve tightness is checked by means of the soapy emulsion in two positions: breaks applied and brakes released. Air leakage through the atmospheric output of the brake valve when the brakes are released indicates that the inlet valve of one of the sections is non-tight, and the air leakage when the brakes are applied indicates that the outlet valve of one of the sections of the brake valve is non-tight. Replace the brake valve in case of leakages.

5.5.2.5 The Four Circuit Brake Valve (Fig. 89) is intended to divide one supply line into two main and two additional circuits; to cut off the circuit automatically in case of its damaging or untightness; to keep the reserve of compressed air in the undamaged circuits; to keep the compressed air in all circuits in case the supply line is damaged.

Compressed air supplied to the outlet I, goes through “a” and “d” throttle openings, opens return valve 15 and comes to the circuit outlets II, III and two additional circuits through “b” and “c” side openings in the valves 3,13.

Initially, the pressure in the circuits increases slowly as air passes throttle and side openings slowly. Having passed the throttle openings, air presses on diaphragms 4,12 and overcoming spring 6,10 force air opens valves 3 and 13 at full extent. The pressure in outlets II and III becomes equal to the outlet I pressure.

Throttle openings in valves 3 and 13 ensure brake drive circuits filling up with air at a very small pressure in outlet I.



1-body; 2, 6, 10, 14-springs; 3, 13-valves; 4, 12-diaphragms; 5, 11-guides; 7, 9-covers; 8-adjustment screw; 15-return valve; I-outlet to the compressor; II, III-outlets to the brake system circuits; a, d-orifice hole; b, c-side holes

Fig. 89 - The Four Circuit Safety Valve

If the air pressure drops in one of the circuits connected to the main outlets II and III, the air pressure in outlet I and in the circuit connected to the main outlet in the good working order drops down to the pressure of faulty circuit valve closing. The pressure in additional circuits falls to the valve closing pressure.

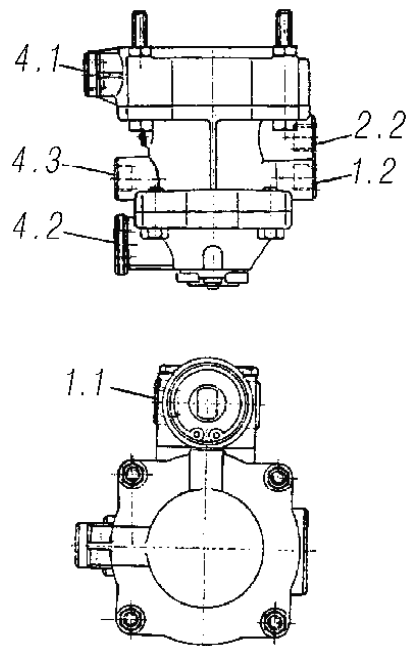
5.5.2.6 Trailer Brake Control Valve with Double-Line Drive and Cut off Valve (Fig. 90), is intended for control of the trailer brake double-line drive. If trailer control mainline is damaged or cut off the valve ensures pressure drop in supply line thus the trailer is braked automatically.

5.5.2.7 The Acceleration Valve (91) is installed in the wheel brake system of rear axles and reduces the brake drive actuation time by restricting the compressed air inlet from the air tank to the actuator.

Compressed air from air reservoir is supplied to outlet I. Outlet II is connected to the brake valve, outlet III is connected to the pneumatic chambers of axle brakes.

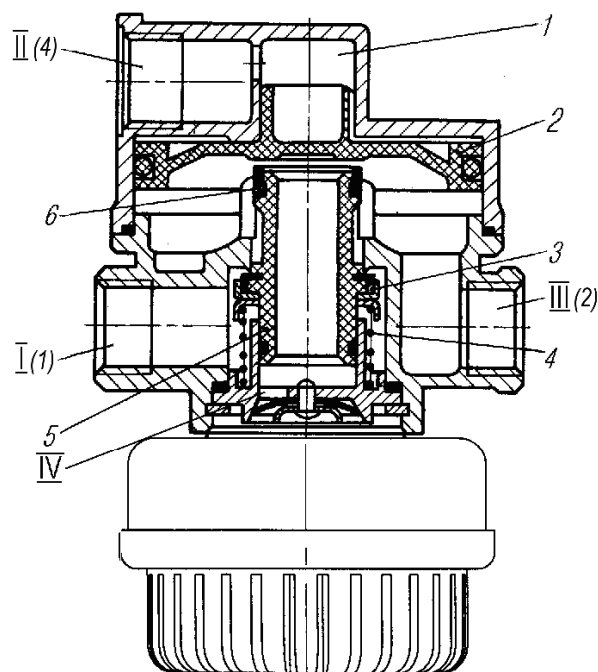
When there is no pressure in the outlet II the piston 2 is in the upper position. The inlet valve 3 is closed because of the spring 4, the exhaust valve 6 is open.

The compressed air from the brake valve goes to the area above the piston - to the chamber 1 and the outlet II. The piston 2 moves down under the influence of compressed air. The exhaust valve closes, the inlet valve opens. The chambers connected with the outlet III are filled up with compressed air from the air reservoir through the outlet I and the open inlet valve. The vehicle is braked by the axles brake.



1.1-supply mainline inlet; 1.2-trailer supply main outlet (to the red coupling head); 2.2-outlet to trailer control mainline (to the yellow coupling head); 4.1-inlet from the front circuit of the truck-tractor service brake system; 4.2-inlet from the rear circuit of the truck-tractor service brake system; 4.3-inlet from the rear circuit of the truck-tractor parking brake system

Fig.90 - Trailer Brake Control Valve with Double-line Drive and Cut-off Valve



1-upper chamber; 2-piston; 3-inlet valve; 4-spring; 5-valve body; 6-outlet valve; I, II, III, VI-outlets

Fig.91 - Acceleration Valve

5.5.2.8 ABS Modulator

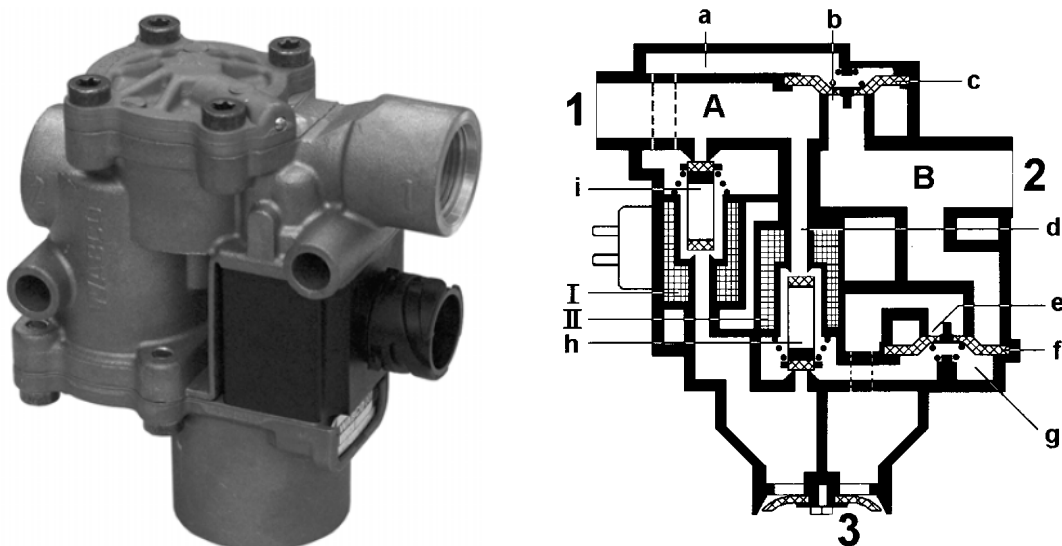
The ABS modulator is shown in Fig. 92. The ABS modulator ensures a quick (milliseconds) pressure boost, reduction or maintenance in the brake chambers during deceleration depending on the control signals of the electronic unit.

Operating principle:

a) Pressure increase — Both magnets I and II of the valves are not actuated, the valve inlet «i» and the valve outlet «h» are closed. There is no pressure in the preliminary control chamber «a» of the diaphragm «c». The compressed air at the outlet 1 from the chamber A goes through the open inlet «b» to the chamber B, then via the outlet 2 to the brake cylinders. Simultaneously, the compressed air passes through the hole «d» to the pre-control chamber «g» of the diaphragm «f» and the outlet "e" remains closed;

б) Pressure drop — If the ABS electronic control unit sends a signal for the pressure relief, the valve I magnet actuates, the valve «i» closes the connection with the outlet 3, and the passage to the preliminary control chamber «a» opens. The compressed air of the chamber A goes to the preliminary control chamber «a» and the diaphragm «c» closes the inlet «b» to the chamber B. Simultaneously, the valve magnet II switches, valve «h» closes the passage of the opening «d» so that the compressed air of the preliminary control chamber «g» can exit to atmosphere through the outlet 3. The diaphragm «f» opens the outlet «e», and the brake pressure at the outlet 2 is vented to atmosphere through the outlet 3;

в) Pressure maintenance — By an appropriate impulse, by reversing the magnet II of the valve «h», the passage to the outlet 3 closes. The compressed air preliminary control chamber «g», and the diaphragm «f» closes the outlet «e». Thus, the pressure increase or pressure drop is blocked in the chamber B and, accordingly, in the brake cylinders.



1-output; 2-output to the brake cylinders; 3-exhaust to atmosphere; A, B-chambers; I, II-magnets; a, g-preliminary control chamber; b-inlet; c, f-diaphragm; d-hole; e-outlet; h, i-valves

Fig. 92 - ABS Modulator

5.5.2.9 Coupling Heads (Fig.93) The heads have covers which protect the system from dust and dirt. The feed head cover is painted red, the control head cover is painted yellow. To connect the trailer brake system properly, couple the heads according to their color.

At first, the control head (yellow) is coupled, and then the feed head (red) is coupled. Disconnect the pneumatic drive of the trailer in the reverse order.

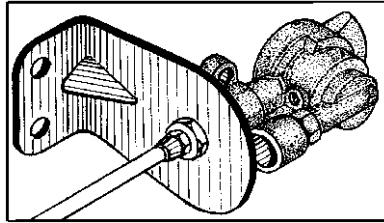


Fig.93 – Coupling Head

5.5.2.10 Check Outlet Valves. The check outlet valve (Fig. 94), determines the output parameters of the air pressure in the circuits with the help of the control pressure gauges.

In order to connect the valve, use the hoses with the coupling nut M16x1,5 and the pressure gauges with the range 0-1000 kPa (0-10 kgf/cm²).

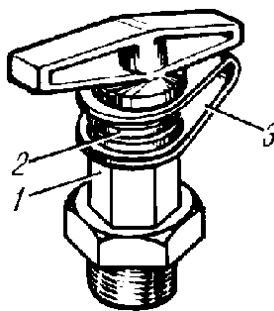


Fig. 94. Check Outlet Valve
1-body; 2-cap; 3-loop

5.5.3 The maintenance of the brakes pneumatic drive

5.5.3.1 While servicing the brake pneumatic drive of the truck the most important issue is the system and its parts air-tightness monitoring. Pay a special attention to the tightness of the pipes and flexible hoses connections as well as hose joints. Considerable air leakage is spotted by ear, while small air leakage is detected with soap solution. The leakage is eliminated by tightening the nuts with the following torque:

- for the pipes with the diameter of 10 mm – 21.6-27.5 N.m (2.2-2.8 kgf.m);
- for the pipes with the diameter of 14 mm – 49.0-60.8 N.m (5.0-6.2 kgf.m);

To avoid the failure of the connecting bosses on the brake mechanisms the tightening torque of the connectors, angle joints and other fittings shall not exceed 30-50 N.m (3-5 kgf.m).

When checking the air-tightness the nominal pressure in the pneumatic drive should be equal to 588 kPa (6.0 kgf/cm²), consumers should be working and the compressor should be turned off.

The pressure drop in the reservoirs from the nominal level shall not exceed 49 kPa (0.5 kgf/cm²) during 30 min with the free controls and during 15 min after they are actuated.

When the pressure governor reacts to the compressor discharge the adsorbent of the oil-and-moisture separator is blown out by dry air from the regeneration reservoir.

The filtering element should be replaced if necessary, when condensate appears in the pneumatic system reservoirs.

5.5.3.2 Parameters for air drive checking:

- pressure governor:
 - a) maximum disengagement pressure 870 kPa (8,7 kgf/cm²);
 - b) minimum engagement pressure 720 kPa (7,2 kgf/cm²);
- four-circuit safety valve: pressure of circuits static closing is 450 kPa (4,5 kgf/cm²);
- trailer brakes control valve: corresponding inlet and outlet pressure of 210 kPa (2,1 kgf/cm²) at the control pressure of 150 kPa (1,5 kgf/cm²).

5.5.4 Emergency brake system

One of the circuits of the service brake system functions as emergency brake. If one of the circuits fails the emergency system ensures the truck braking with sufficient efficiency.

5.5.5 Parking brake system

5.5.5.1 Parking brake system is used for holding the truck on the grades. The parking brake has air drive. The brake is controlled by the brake valve with manual control by the handle located to the right of the driver's seat

5.5.5.2 Parking and emergency brakes air drive operation. Compressed air from the reservoir 23 via return valve 24 (see Fig. 82) flows to the parking brake control valve 21, then to the control line of the acceleration valve 20. As a result, the latter blows air from reservoir 23 into the spring brake cylinders 15.

When applying the parking brake (the valve 21 handle is fixed as BRAKED) air from the control line of the acceleration valve 20 goes into the atmosphere. The springs are loosened and actuate the wheel brake mechanism.

The parking brake control valve is a servosystem which controls the truck deceleration rate depending on the position of the valve handle.

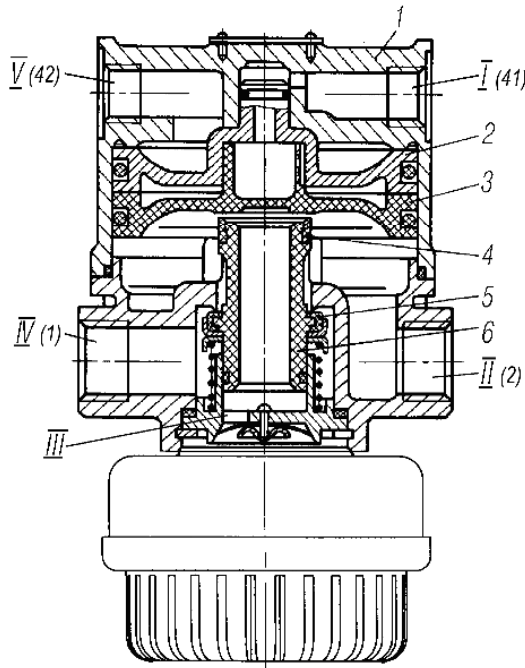
In case of emergency pressure drop in the drive circuit of the parking brake, the spring brakes 15 actuate automatically and the truck is braked.

5.5.5.3 The acceleration valve of the parking brake is shown in Fig. 95. Compressed air from air reservoir is supplied to outlet IV. Outlet I is connected to the emergency and parking brakes valve, outlet II is connected to the spring brakes. The control pressure from service brake system is supplied to the outlet V. By this the air from parking brake system reservoir is supplied into the spring brakes.

When the service brakes are applied the parking brake system is blocked.

When there is no pressure in the outlet I the piston 3 is in the upper position. The inlet valve 5 is closed under the action of spring; the outlet valve 4 is opened.

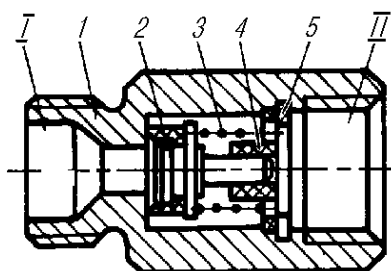
Through the opened outlet valve and outlet II the spring brakes are connected to the atmosphere via outlet III. The truck is braked by spring brakes. If the truck is braked by service brakes system in so doing, then the pressure from the brake valve goes into outlet V and moves the piston 2 down together with the piston 3. Outlet valve 4 is closed and inlet valve 5 is opened. So the service brake is protected against the joint effort of service brake diaphragm and spring brake.



1-upper body; 2-upper piston; 3-lower piston; 4-outlet valve; 5-inlet valve; 6-valve's body; I-outlet from the hand operated brake valve; II-outlet from spring brakes; III-outlet to the atmosphere; IV-outlet from air reservoir; V-outlet from the brake valve

Figure 95 – Parking Brakes Acceleration Valve

5.5.5.4 Return valve is shown in Fig. 96. When the compressed air is delivered into the outlet I, the valve 2 is opened having overcome the spring 3 effort; due to that the compressed air goes to the outlet II. When the pressure in the outlet I is reduced, the valve 2 goes to the seat in the body 1 due to spring 3 effort and pressure difference in the outlets I and II. Reverse flow of the compressed air from the outlet II to the outlet I is impossible.

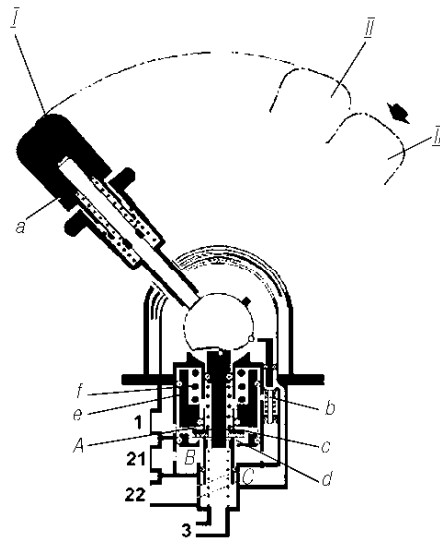


1-body; 2-valve; 3-spring; 4- guide bushing; 5-thrust ring; I-compressed air inlet; II-compressed air outlet

Figure 96 – Return Valve

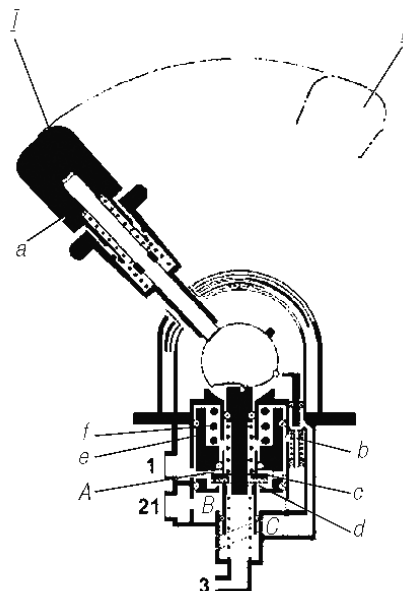
5.5.5.5 The hand-operated brake valve shown in Fig. 97,98 is designed to control the spring brakes and allows to check the sufficiency of truck tractor parking brake for whole road train holding on the grade.

Hand-operated brake valve for auxiliary and parking brake system is used together with brake chambers with spring brakes. Additional connection to the trailer brake control valve ensures braking action transmission to the trailer. Position for truck parking brake efficiency check is available.



a- handle; b, c- valves; d- outlet; e- piston; f- spring; A, B, C- chambers; I- travelling; II- parking; III- checking

Figure 97- Hand-Operated Brake Valve for Trucks with Trailer Facilities



a- handle; b, c- valves; d- outlet; e- piston; f- spring; A, B, C- chambers; I- travelling; II- parking

Figure 98 - Hand-Operated Brake Valve for Trucks without Trailer Facilities

5.5.6 Vehicle Brake System with Antilock Brake System (ABS)

5.5.6.1 Antilock Brake System (ABS) is intended to preserve the truck stability at braking with improved efficiency when traction differs. Due to the ABS the truck gains the number of advantages:

- improved active safety, stability and steerability especially on wet and slippery roads;
- possibility to increase the average safe driving speed;
- **tires extended service life.**

ABS consists of wheel angular velocity sensor, braking pressure modulator, the electronic control unit, fuse box, connecting cables, pilot lamp, buttons of diagnostics and off-road mode switch.

5.5.6.2 Solenoid valve (ABS modulator) is shown in Fig. 92.

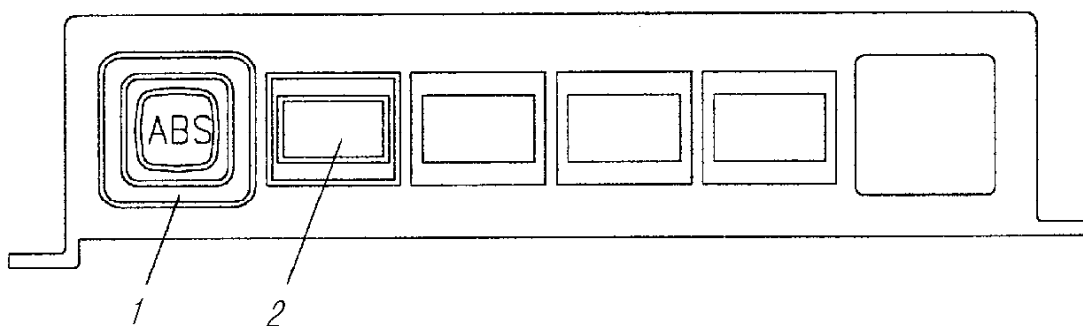
5.5.6.3 Electronic control unit (ECU) is the basic part of the ABS. Control unit is located in the cab on the instrument panel. The unit is designed for processing the signals from the angular velocity sensors, issuing the control signals to modulators, switch-off relay of the auxiliary brake solenoid valve and the pilot lamp, as well as for the system diagnostics.

Control units are protected against leakage and short circuit, electrostatic discharge, voltage drop, voltage surge during start-up and other electrical transients.

Control unit has a mode for advantageous passing over the soft pavement in terms of reducing the braking distance and preserving stability and steerability. The driver may turn-on the «off-road» function on the instrument panel. Pilot lamp blinking indicates that the «off-road» ABS function has been turned on.

Do not use ABS special mode on the roads as it may cause stability and steerability loss.

5.5.6.4 The ABS operation, maintenance and diagnostics. When the starter lock is actuated (the key is turned to the position «INSTRUMENTS»), the control lamp 2 (Fig. 99) is turned on, the electric circuits of electronic unit, sensors, modulators and switching devices are automatically tested, when the testing is completed the lamp goes out in case of faults absence.



1-ABS diagnostics switch; 2-pilot lamp

Figure 99 – ABS control unit

If the memory has records about faults upon their trouble shooting, the pilot lamp goes out when the truck speed reaches 5-7 km/h. In case of faults in the system or in the electric circuits of one of the elements (modulator, sensors) or control circuits the pilot lamp 2 lights up. By this the corresponding ABS circuit may be disconnected and the brake system will operate in the common mode (without ABS mode).

The system does not require special maintenance except the control check of functioning and ABS sensors installation when the bearings in the wheel units are adjusted or replaced or when the linings are replaced.

5.5.6.5 ABS diagnostics. System status may be determined either with the diagnostic equipment or by using blink codes (light codes). Check by blink codes is simple and requires no special equipment.

Diagnostics by blink codes is intended for determining the faults which were found by the ECU.

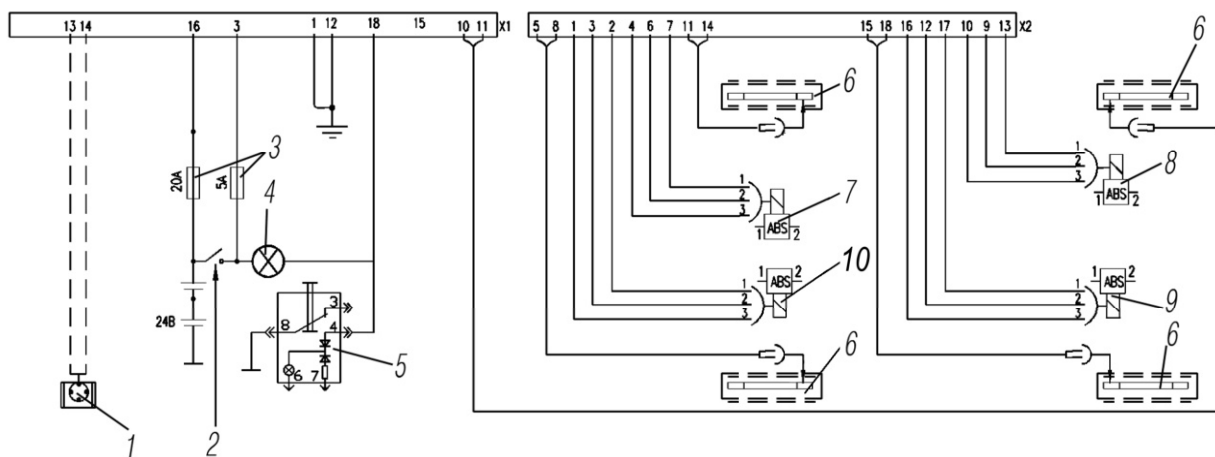
Turn the ignition on before starting the diagnostics by blink - codes (supply the ABS with voltage ABS).

(подать напряжение на АБС).

ABS is not functioning during the diagnostics process! After turning the ignition key on, wait minimum for 1 second before pushing diagnostics button.

5.5.6.6 Knorr Bremze ABS diagnostics by blink codes

5.5.6.6.1 Electric circuits of components connection to Knorr Bremze control unit are shown in Fig. 100.



1—diagnostic socket; 2—ignition switch; 3—fuses; 4—pilot lamp; 5— diagnostics switch; 6—rotation sensors; 7— front modulator, r.h.; 8—rear modulator, r.h.; 9—rear modulator, l.h.; 10—front modulator, l.h.

Figure 100 - The Scheme of Connecting Knorr Bremze Control Unit Plugs

The errors codes are recalled by means of one time pressing the diagnostics button for 0,5-8 sec, and displayed by control lamp blinking (so called “blink-codes” output) as shown on Fig.101.

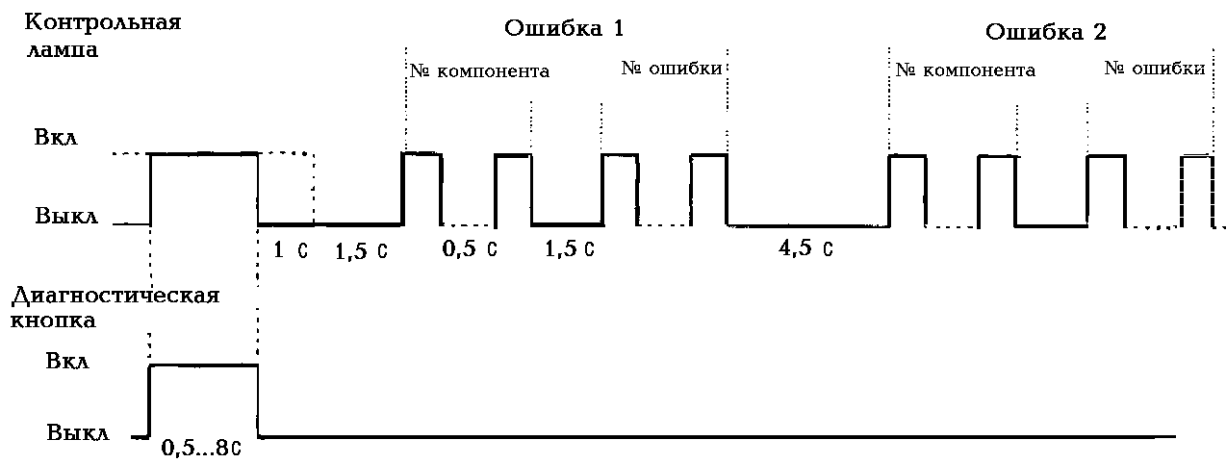


Figure 101 - Error codes (blink-codes) display

Each error is presented by the block consisting of two digits the first is for component number and the second is for error number.

Errors codes are given in Table 6.

Displaying of the errors codes can be interrupted by diagnostics button re-pressing.

Table 6 – Errors codes

Blink code		Description
of component	of error	
1	1	No faults
Driven axle speed sensor, l. h.		
2	1	Air gap is too large
2	2	Absence of sensor signal at braking
2	3	Bad impulse ring, ABS maintenance period
2	4	Signal instability
2	5	Sensor signal loss
2	6	Short-circuit to “ground” or to the battery, or wire breakage
Driven axle speed sensor, r. h.		
3	1	Air gap is too large
3	2	Absence of sensor signal at braking
3	3	Bad impulse ring, ABS maintenance period
3	4	Signal instability
3	5	Sensor signal loss
3	6	Short-circuit to “ground” or to the battery, or wire breakage
Driving axle speed sensor, l. h.		
4	1	Air gap is too large
4	2	Absence of sensor signal at braking
4	3	Bad impulse ring, ABS maintenance period
4	4	Signal instability
4	5	Sensor signal loss
4	6	Short-circuit to “ground” or to the battery, or wire breakage

Table 6 Continuation

Blink code		Description
of compo- nent	of error	
Driving axle speed sensor, r. h.		
5	1	Air gap is too large
5	2	Absence of sensor signal at braking
5	3	Bad impulse ring, ABS maintenance period
5	4	Signal instability
5	5	Sensor signal loss
5	6	Short-circuit to “ground” or to the battery, or wire breakage
Driven axle modulator, l.h.		
8	1	Release coil short circuit to the battery
8	2	Release coil short circuit to the “ground”
8	3	Release coil wire breakage
8	4	Wire breakage on the general PIN
8	5	Rising coil short circuit to the battery
8	6	Rising coil short circuit to the “ground”
8	7	Rising coil wire breakage
8	8	Valve configuration error
Driven axle modulator, r.h.		
9	1	Release coil short circuit to the battery
9	2	Release coil short circuit to the “ground”
9	3	Release coil wire breakage
9	4	Wire breakage on the general PIN
9	5	Rising coil short circuit to the battery
9	6	Rising coil short circuit to the “ground”
9	7	Rising coil wire breakage
9	8	Valve configuration error
Driving axle modulator, l.h.		
10	1	Release coil short circuit to the battery
10	2	Release coil short circuit to the “ground”
10	3	Release coil wire breakage
10	4	Wire breakage on the general PIN
10	5	Rising coil short circuit to the battery
10	6	Rising coil short circuit to the “ground”
10	7	Rising coil wire breakage
10	8	Valve configuration error
Driving axle modulator, r.h.		
11	1	Release coil short circuit to the battery
11	2	Release coil short circuit to the “ground”
11	3	Release coil wire breakage
11	4	Wire breakage on the general PIN
11	5	Rising coil short circuit to the battery
11	6	Rising coil short circuit to the “ground”
11	7	Rising coil wire breakage
11	8	Valve configuration error

Table 6 Ending

Blink code		Description
of compo- nent	of error	
Diagonals grounding connection PINs		
10	10	Diagonal line 1 is short-circuited to the storage battery
10	11	Diagonal line 1 is short-circuited to «ground»
10	12	All modulators are short-circuited to «ground»
Electronic control unit (ECU) inner errors		
15	1	Faulty ECU
15	2	Faulty ECU
15	3	Faulty ECU
15	4	Faulty ECU
15	5	Faulty ECU
15	6	Faulty ECU
15	7	Faulty ECU
15	9	Faulty ECU
15	10	Faulty ECU
15	11	Faulty ECU
Power supply		
16	1	Diagonal line 1, high voltage
16	2	Diagonal line 1, low voltage
16	3	Diagonal line 1, wire breakage
16	4	Wire breakage or significant voltage difference
16	9	High voltage
16	10	Low voltage
Retarder interface		
17	1	Retarder brake relay is short-circuited to the storage battery or wire breakage
17	2	Retarder brake relay is short-circuited to «ground»
17	4	ERC1 breakage
Special errors		
17	5	Front and rear tire size differs significantly
17	9	«Bad road» BAS function is activated
17	10	Emergency lamp defect
17	12	Sensors parameters memory problem
17	13	Axle 1 and 2 sensors are entangled

5.5.6.6.2 Errors memory deleting

After trouble-shooting of the system it is necessary to delete the error from the memory of errors of control unit, as it is shown in Fig.102.

To do this, it is necessary to press the diagnostic button with the ignition off, and release the button only having the ignition turned on. In less than 3 seconds the memory of error is deleted.

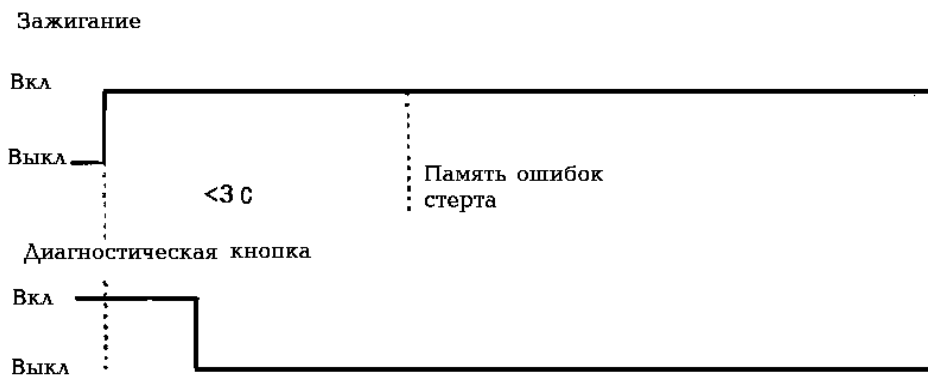
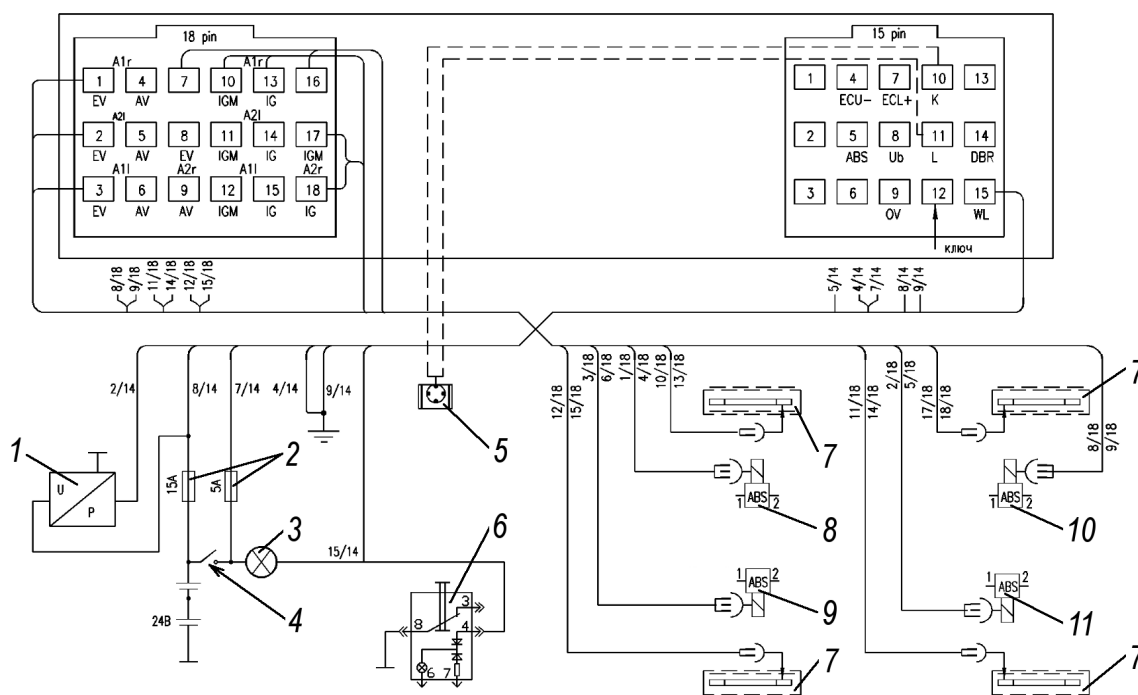


Figure 102 - Errors Memory (Blink - Codes) Deleting

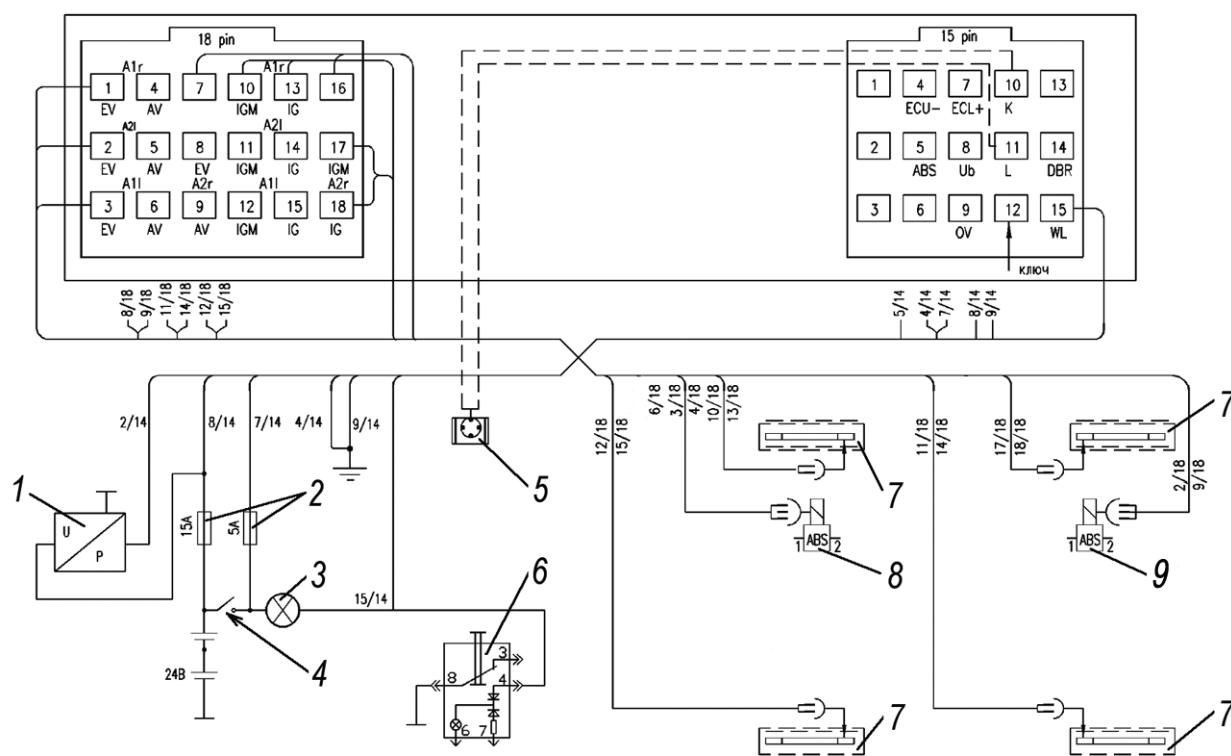
5.5.6.7 Wabco ABS Diagnostics by the Blink-Codes

5.5.6.7.1 Electric circuits of components connection to Wabco control unit are shown in Fig. 103(a) and 103(b).



1-pressure sensor; 2-fuses; 3-pilot lamp; 4-ignition switch; 5-diagnostic socket; 6-diagnostics switch; 7-rotation sensors; 8-front modulator, r.h.; 9-front modulator, l.h.; 10-rear modulator, r.h.; 11-rear modulator, l.h

Figure 103(a) - The Scheme of Connecting Wabco Control Unit Plugs (for 6x6 trucks)



1-pressure sensor; 2-fuses; 3-pilot lamp; 4-ignition switch; 5-diagnostic socket; 6-diagnostics switch; 7-rotation sensors; 8-front axle modulator; 9-rear axle modulator

Figure 103(b) - The Scheme of Connecting Wabco Control Unit Plugs (for 4x4 trucks)

To activate the diagnostics mode it is necessary to connect the ABS lamp to the battery minus terminal for 0.5 to 3 seconds by means of ABS diagnostics switch button as shown in Fig. 104.

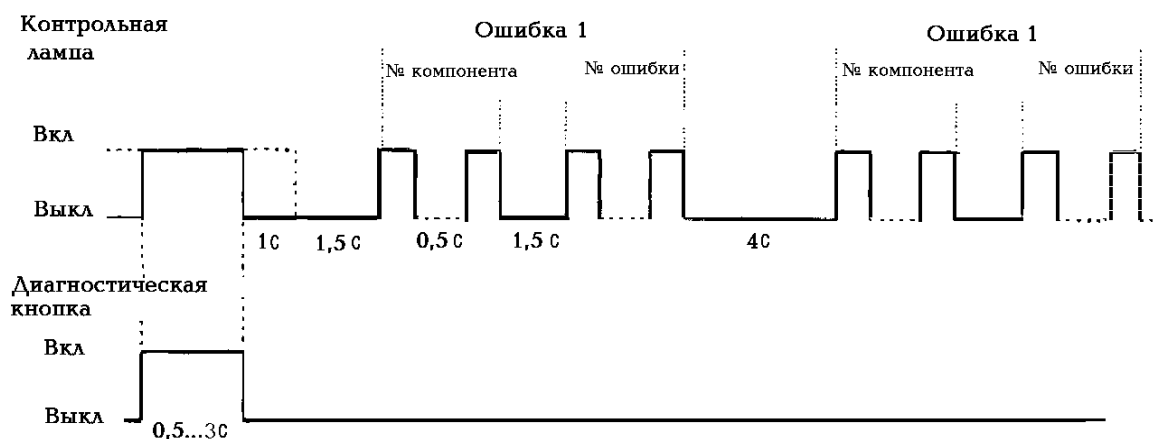


Figure 104 - Error Codes (Blink-Codes) Display

The duration of 'lamp-“-”' connection determines the information display mode (connection of the lamp to “-” during 3-6.3 seconds activates the system mode). After pressing the diagnostics button for a specified time, the pilot lamp lights up for approximately 0.5 seconds to confirm that the grounding has been registered and received by the electronic control unit.

If a new error appeared during reading is registered by the control unit, or if the pilot lamp is connected to minus terminal for more than 6,3 sec., the system exits the diagnostics mode. If the pilot lamp was connected to the minus for more than 15 sec., then the pilot lamp breakage is registered.

If an active error was registered while switching the ignition on, then the control unit will display only this error in the diagnostics mode activation; if several active errors were registered, then the active fault which was registered last will be displayed in the diagnostics mode.

To exit the diagnostics mode it's necessary to switch the ignition off/on or to drive the truck (the speed signal from several axles available).

If no active errors were registered at switching the ignition on, then at the diagnostics mode activation the passive errors (not present in the system at this moment) will be displayed in the order reverse to their appearance (at first the last error, then the first one). The number of the error doesn't show the succession of the error appearance. The passive errors output mode is off when the last passive error recorded in the electronic unit memory has been displayed.

The list of errors codes for Wabco and the list of possible troubles and methods of trouble-shooting are given in Tables 7 and 8.

If the pilot lamp doesn't go out after the trouble-shooting, contact the service centre.

Shut the engine off and disconnect the system power supply during repair and trouble-shooting. The system is disconnected from the power supply when the starter and instruments switch key is turn in the position «OFF» and the ground is disconnected.

Disconnect the plug connectors from the electronic control unit prior to welding works.

Table 7 – **Errors blink-codes for Wabco**

The first series of error report code		The second series of error report code	
1	No faults	1	No faults
2	Modulator	1	Front, right-handed
3	Sensor (high clearance between sensor and toothed rotor)	2	Front, left-handed
4	Sensor (sort circuit or disconnection)	3	Rear, right-handed
5	Sensor (intermittent signal)	4	Rear, left-handed
6	Toothed rotor	5	The third axle, right-handed
		6	The third axle, left-handed
8	Electronic control unit	1	Power supply low voltage
		2	Power supply high voltage
		3	Inner fault
		4	Configuration fault
		5	Connection to the storage battery minus terminal

Table 8 – Troubles and methods of trouble-shooting for Wabco

Error code	Method of trouble-shooting
2-...	Check the modulator cable. Wire breakage or their insulation damage is possible.
3-...	Low value of sensor signal amplitude. Check bearing and toothed rotor runout, move the sensor closer to the rotor. Check sensor cable continuity and contact closeness in plug-and-sockets.
4-...	Check sensor cable continuity
5-...	Check sensor cable. Check toothed rotor for absence of damages. Wheels diameters or toothed rotors teeth number may be different.
6-...	Check toothed rotor for absence of damages, Runout, for all teeth availability. Change faulty rotor if necessary.
8 - 1	Check power supply cable and safety fuse. Low voltage in the truck power network.
8 - 2	Check voltage on generator and accumulator terminals
8 - 3	Replace the control unit if the error is repeated.
8 - 4	Electronic control unit doesn't correspond to the specified number of wheel sensors and modulators. Replace the control unit.
8 - 5	Check “grounding” of the electronic control unit and modulators.

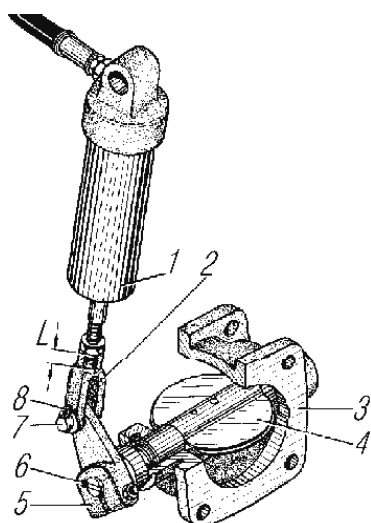
5.5.7 Auxiliary brake system

The auxiliary compression type brake reduces the vehicle speed on long downgrades. Braking deceleration is achieved by creating back pressure in the exhaust gas pipes of the engine when they are overlapped by shutters.

The brake consists of the case 3 (Fig. 105) and the shutter. The shutter is driven by the air cylinder 1 fixed by the bracket on the case of the auxiliary brake.

In case it is necessary to decelerate, press the button of the auxiliary brake pneumatic control valve located on the cab floor. Compressed air is delivered to the air cylinder, the piston moves closing the shutter.

Simultaneously the signal is transferred to the trailer brakes drive and the trailer is braked slightly.



1-Air cylinder; 2-drive rod fork; 3-case; 4-shutter; 5-shutter shaft lever; 6-key; 7-pin; 8-cotter pin

Figure 105 – Auxiliary brake

By moving foot from valve button the air from the cylinder goes into the atmosphere, the rod under the action of pull-back spring turns the lever and shutter into their initial position.

The auxiliary brake is actuated and the blocked drive cuts the fuel supply. The design of the air cylinder of fuel supply shut-off is identical to the design of auxiliary brake air cylinder. When traveling with the auxiliary brake applied:

- do not exceed the cranking speed of 2100 min^{-1} ;
- do not shift the gears in the gearbox from high gear to low gear at the cranking speed, near to 2100 min^{-1} .

If required, reduce the cranking speed by applying service brake and throw into low gear.

If the shutter 4 of the auxiliary brake turns with difficulty, remove the brake body with the shutter, wash in kerosene and blow through with compressed air. If the rods of the air cylinders or the control valve button seize, disassemble the units, wash in kerosene, replace faulty parts, lubricate the friction surfaces with a lubricant and put them into place.

Adjust the shutter position by changing the screwing length L of the air cylinder rod with the fork.

If the shutter is installed correctly, the key is located along the intake pipe axis when the air cylinder piston is in extreme upper position.

5.6. Electrical equipment

The system of electric equipment is wired as a single-conductor circuit in which the negative terminals of power-supply sources and consumers are grounded to the truck body. The negative terminal of the storage battery is connected with the «ground» by a distance switch.

The power-supply sources are two storage batteries, connected in series, and a generator that operates in conjunction with an integrated voltage regulator. The units and instruments relating to the electric equipment are connected by P.V.C.-insulated conductors of various sections. For easy location and assembling of wires in bunches, they have a particular coloring. Single wires may be of any color. The wire coloring is marked with the first letter of the color name on the collars provided on both ends of the wire.

The wires are connected to each other and with the instruments by plug and socket joints.

The truck has electronic speedometer, electronic devices and systems: tachometer, generator with rectifier assembly, etc.

To ensure reliable operation of the said instruments and systems, care should be taken to the condition of the fuses installed in boxes. Avoid the use of non-standard fuses such as bended wires, bolts, washers, because it will result in immediate failure of the electronic items if a short-circuit occurs. A blown-out fuse should be replaced by the one having the same value of working current.

The electric circuit diagram for trucks is shown in Fig. 106 (see the insert). Underlines to Fig. 106 are given in Table 9.

Table 9 - Electric devices

Item, Fig. 106	Description	Item type or number
1	Front lamp	ПФ130АБ-01 or 112.02.022
2	Right headlamp electric drive	-
3	Right headlamp	62.3711-19 or 401.3711
4	Low-tone sound signal	C306Д or 24.3721
5	High-tone sound signal	C307Д or 241.3721
6	Left headlamp	62.3711-19 or 401.3711
7	Left headlamp electric drive	-
8	Side turn light	511.3726010 or УПБ 1.101
9	Front clearance light	264.3712
10	Side clearance light	431.3731-01 or 50.3731-05
11	Cab dome light	ПТ37-3М
12	Road train sign light	2512.3726-02
13	Windshield wiper relay	S 4031.3747
14	Windshield wiper electric drive	29.3780
15	Windshield washer fuse	ПП119-01 (6А)
16	Windscreen wiper and washer switch located under steering wheel	9902.3709-01
17	Turn lights and headlamp beam switch located under steering wheel	1102.3769-02
18	External lighting switch	П305-3709000-0

Item, Fig. 106	Description	Item type or number
19,90	Safety fuse, 25A	14.3722
20	Safety fuse, 6A	ПР119-01
21	«Ground» remote switch	11.3704-01
22	Starter and instruments switch	2109.3704-30
23	Glow plug preheater switch	11.3704-01
24	Turn light break-in relay	5412.3787
25	Portable lamp socket	47К
26	Pilot lamps left cluster	ПД512Е
27	Engine control system indicator	2212.3803-85
28	Air filter clogging indicator	2212.3803-20
29	Interface Engine Unit (IEU) switching-on indicator	2212.3803-34
30	Cross-axle differential locking indicator	2212.3803-13
31	Headlamp upper beam indicator	2212.3803-28
32	Storage batteries discharge indicator	2212.3803-16
33	Pilot lamps right cluster	ПД 511Е
34	Emergency lighting switch	245.3710-01 or 249.3710-02
35	Terminal block for tachograph connection	1-967621-1 («Тысо»)
36	Engine idling speed control terminal block	1-967621-1 («Тысо») or 4573739012
37	Interface Engine Unit (IEU)	БДИ1М
38	Tire pressure gage	2411.3830
39	Fuel level indicator	34.3806010 or УБ170М-3806010
40	Voltage indicator	11.3812010
41	Electronic speedometer	ПА8046-4П
42	Electronic tachometer	6201.3813010
43	Oil level indicator in engine lubrication system	УК170М or 33.3810
44	Coolant temperature indicator	УК171М or 36.3807
45	Two pointer pressure gage	1921.3830010
46	Audible alarm (buzzer)	733.3747-10
47	Socket for diagnostics	OBD-II (MOL 51116-1601)
48	Inter-axle differential locking indicator	2212.3803-14
49	Transfer case low gear engagement indicator	2212.3803-34
50	Auxiliary power take-off disengagement disconnecting switch	3842.3710-02.30
51	Power take-off disengagement disconnecting switch	3842.3710-02.30
52	Cab dome light disconnecting switch	БК343-3709-01.08
53	Cross-axle differential locking disconnecting switch	3842.3710-02.28
54	Interface Engine Unit (IEU) diagnostics disconnecting switch	3842.3710-11.88
55	Rear fog light disconnecting switch	3842.3710-11.04
56	Road train sign light disconnecting switch	3842.3710-02.38
57	EDC diagnostics disconnecting switch	3842.3710-11.161
58	Inter-axle differential locking disconnecting switch	3842.3710-02.29
59	Transfer case gears disengaging disconnecting switch	3842.3710-11.00
60	Engine idling speed disconnecting switch	3842.3710-11.00
61	Head floodlight disconnecting switch	3842.3710-02.05
62	Heater operating modes switch	82.3709-25.09

Item, Fig. 106	Description	Item type or number
63	Engine idling speed switch	771.3709-02.00
64	Transfer case gear shifting switch	82.3709000-28.00
65	Cab heater electric motor	-
66	Additional resistance	CЭ300-8102100
67	«Stop» signals relay	751.3777-02
68	Brake pedal position sensor relay	751.3777-02
69	Horn relay	751.3777-02
70	Headlamp upper beam relay	751.3777-02
71	Headlamp lower beam relay	751.3777-02
72,73	Terminal «15» unloading relay	2-1904025-6
74	Battery switch locking relay	751.3777-02
75	Clearance light relay	751.3777-02
76	Rear fog light additional relay	751.3777-02
77	Rear fog light relay	211.3777M
78	Fuse boxes	41.3722-09
79	Headlamps adjuster	ЭМКФ35
80	Accelerator pedal	61000NO-51SD-42
81	Storage battery	TITAN STANDART 6CT-190OL (ST) or 6CT-190N3
82	«Ground» disconnecting switch	1400.3737
83	Windshield washer electric motor	МЭ 268
84	Air filter clogging sensor	131.3839600 or ДСФ-65
85	Thermobimetallic fuse	291.3722000
86	Oil filter clogging sensor	
87	Generator	4512.3771-10
88	Stator	AZF4581 or 5432.3708-01
89	Stator relay	738.3747-20
91	Engine retarder disconnecting switch	2802.3829010
92	Switch of the signal in the body	BK322.3710-0
93	Portable lamp socket in the body	47K
94	Fuel heating element in fuel coarse filter	-
95	Air dryer heating element	-
96	Reverse light switch	BK403B or BK24-1
97	Power take-off engagement sensors	BK403B or BK24-1
98	Inter-axle differential locking sensor	BK403B or BK24-1
99	Transfer case lower gear engagement sensor	BK403B or BK24-1
100	Air pressure emergency drop sensors	6072.3829 or 2702.3829 or ДЕ-В
101	Braking signals switching-on sensor	2802.3829 or АДЮИ.407529.003
102	Brake failure sensor	BK503
103	Speed sensor	ПД8093-1 or 2159.20102301
104	Auxiliary power take-off engagement sensors	BK403B or BK24-1
105	Fuel level indicator sensor	5202.3827010
106	Parking brake engagement sensor	6072.3829.000
107	Cross-axle differential locking sensor	BK403B or BK24-1
108	Electroneumatic valve of transfer case high gear engagement	КЭМ 10Д or 7.Д3.254.022

Item, Fig. 106	Description	Item type or number
109	Electroneumatic valve of cross-axle differential locking	КЭМ 10Д or 7.Д3.254.022
110	Electroneumatic valve of auxiliary power take-off engagement	КЭМ 10Д or 7.Д3.254.022
111	Electroneumatic valve of power take-off engagement	КЭМ 10Д or 7.Д3.254.022
112	Electroneumatic valve of transfer case neutral gear engagement	КЭМ 10Д or 7.Д3.254.022
113	Electroneumatic valve of transfer case low gear engagement	КЭМ 10Д or 7.Д3.254.022
114	Electroneumatic valve of inter-axle locking	КЭМ 10Д or 7.Д3.254.022
115	Trailer socket	ПС326-3723 or СНЦ125-7/45P034-01
116	Trailer socket	ПС325-3723 or СНЦ124-7/45P034-01
117,119	Rear lamp	7442.3716-10 or 8512.3716-01
118	License plate lamp	ФП131АБ-02
120	Flood head lamp	2012.3711 or 112.05.44
121	Engine preheater switch	4602.3710010
122	Glow plug switchВыключатель свечи	ВН-45М
123	Fuel heating switch	ВН-45М
124	Solenoid valve switch	4602.3710
125	Solenoid valve	-
126	Starting preheater	ПЖД 30
127	High voltage source	9301.3734 or 9301.3734-01
128	Spark plug	СН423
129	Preheater electric motor	МЭ252
130	Glow-plug preheater solenoid valve	11.3741
131	Glow plug	11.3740
132	Voltage regulator switching-off relay	751.3777-02
133	Glow-plug preheater relay	751.3777-02
134	Resistor with thermobimetallic contact	12.3741

5.6.1 Electronic speedometer

Electronic speedometer ПА 8046-4 П is intended for operation in set with pulse transducer ПД8093-1 or other similar (in accordance to specifications and technical documentation in force) transducer converting rotation frequency of its drive shaft to the rectangular unidirectional pulses which are input signals of the device.

When replacing the electronic speedometer, calibrate it (define calibration coefficient numerical value, i.e. number of pulses from transducer per a kilometer of run).

Speedometer ПA8046-4П is a complicated electronic device the truck driving safety directly depends on. It is recommended to calibrate the speedometer in the “Ural” Automobile Works” OE JSC regional service centers. In case it is impossible, speedometer calibration should be performed strictly observing instructions below.

5.6.1.1 Speedometer calibration:

1. Place the truck on the zero mark of the previously measured and marked straight road section. Road section can be a whole multiple part of 1000m, ex.: 100m, 50m or 20m, to simplify the calculation.

2. Press the button on speedometer back part for data entering. Holding the button pressed start the engine. Four seconds after the engine start release the button. The signs «П - - - -» appear on digital display.

3. Enter the access password necessary for coefficient change. Blinking symbol means readiness for changes. Enter the numerical- alphabetical symbol by short pressing (less than 1 second). Enter the previous password first which is written under the speedometer sealed cover, ex.: «П 0 0 0 1»; after that enter the new password (any four-digit number), ex.: «H 0 0 0 1».

Warning! Further speedometer calibration is impossible when the password is lost! For entered password registration it is recommended to record the passwords into the register and change them periodically.

4. Enter the calibration mode by short pressing (“0” should appear in the extreme right position). Driver should drive the truck at low speed for defined road section and stop the truck at the assistant command by the end mark. The number of pulses counted during passing the defined road section will be presented on the speedometer digital display. To make the calculation more precise, carry out several measurements by reversing the truck and writing down numerical values at the initial and end marks (values should be summed up). Mean value is calculated after several measurements. Number of pulses per each drive of defined section is calculated by subtraction of the previous value from the subsequent one. Obtained pulse mean is multiplied by the number which is equal to a truck run, i.e. a multiple of 1000 meters, according to the formula stated below:

$$E = \frac{1000 * D}{L}$$

where L — truck run;

P — indicated by the device pulse number.

For example: if speedometer recorded 504 pulses per 100 m of run then enter the calibration coefficient equal to 5040 (e.i. 504x10). Other example: if speedometer recorded 99 pulses per 20 m of run then enter the calibration coefficient equal to 4950 (e.i. 99x50) etc.

5. Programmable coefficient entering:

Enter previously used password prior to entering a new password in order to prevent programmable coefficient unauthorized changing. For this purpose do the following:

1. Activate previously used coefficient display by short pressing. Activate extreme right symbol blinking by long pressing (used for transition to the next symbol or to the next programming stage). Enter required coefficient by short pressings (used for figure or letter choice), e.g. "0 4 9 5".

2. Confirm the entered number by long pressing. Press the button shortly for technological mode exit.

Note. In case figure or letter is entered incorrectly, reenter the required symbol in the place by short successive "in a circle" pressings.

Speedometer 87.3802 (in a set with 4222.3843010 transducer or similar transducer) can be installed on the truck instead of speedometer ПА 8046-4П.

Speedometer 87.3802 has liquid-crystal display consisting of two lines and shows total and daily truck run. Maximum truck speed can be set on this device which indicator will signal overrunning. Control button for indication mode choice and present values correction is located on the device front part.

Speedometer indicator has seven modes presented in the Table 10 (modes 1, 2, 3 do not require access password entering; mode 4 is for access password entering; modes 5, 6, 7 are protected by access password):

Table 10

Mode number	Upper line readings	Lower line readings	Symbol
1	Total run	Daily run	km
2	Total run	Maximum speed	km/h
3	Total run	Blinking value of maximum speed	km/h
4	«-CodE-»	«0000»	-
5	Calibration coefficient	-	-
6	Calibration coefficient (setting)	-	-
7	Blinking value of pulses from transducer	-	-

Mode 1 is set after ignition lock switching on and speedometer pointer setting to the zero position on the scale. Odometer zeroing can be done in this mode by pressing the button not less than 3 seconds.

Mode changes to the second one by button short pressing (less than 3 seconds). Maximum speed value can be adjusted in the second or third mode by button rotation.

The third mode is a warning one; it switches on automatically when the truck overruns. Indicator returns to the previous mode when the truck slows down.

Access password protecting the fifth, the sixth and the seventh modes is entered in the fourth mode. When switching on ignition lock, press the control button (not less than 3 seconds) until sign «-CodE-» appears. To enter the password, press the button for a second time (not less than 3 seconds) and release it when the first left zero in the lower line starts blinking. Figure is

changed by button rotation. New value of blinking figure is confirmed by button short pressing after which the next figure starts blinking.

Access password is under sealing cap at the device rear part.

If the password is entered correctly short pressing will change the indicator to the fifth mode, in case the password was incorrect, the indicator mode changes to the first one by short pressing.

The fifth mode:

- button rotation in any direction changes indicator for *the seventh mode* for counting number of pulses from transducer;
- button long pressing (until the coefficient first left figure starts blinking) causes change for *the sixth mode* for new calibration coefficient entering;
- button short pressing switches indicator to *the first mode* and activates updated calibration coefficient.

The sixth mode allows to enter new calibration coefficient (number of pulses from transducer per a kilometer of run).

Blinking figure value is changed by button rotation and confirmed by button short pressing after which the next figure starts blinking, etc. When the calibration coefficient last fifth figure is entered the indicator is changed to the fifth mode by button short pressing. Indicator will show 1100 value (if the coefficient less than 1100 is set) or 25000 value (if the coefficient more than 25000 is set).

The seventh mode is presented by six blinking zeros in the upper line. If the truck runs for example 100 meters with this mode active and stops than upper line will show the number of the incoming pulses. Multiply this number by ten; the result is a calibration coefficient (quantity of pulses from transducer per a kilometer of run). Do several countings of pulse quantity and calculate the coefficient arithmetic mean to get more precise result.

Any further button manipulation results in the change for *the fifth mode*.

5.6.2. Generator

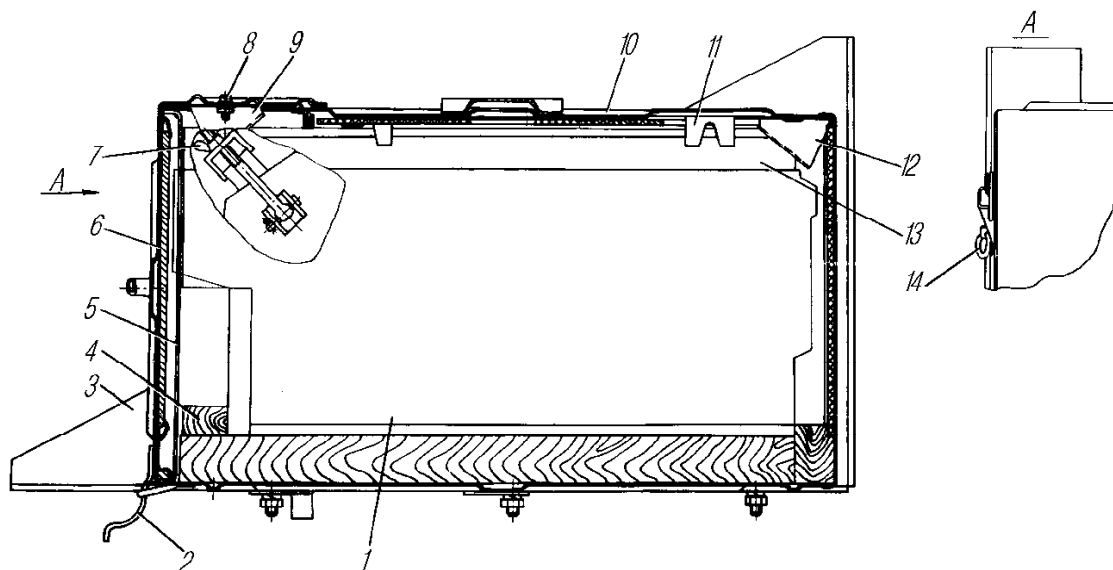
Adjust the generator belts tension in accordance with Engine Operation Manual.

5.6.3. Storage batteries

The storage batteries are designed to start the engine with the help of starter and operate in combination with the generator at maximum loads.

The truck is equipped with storage batteries filled in with electrolyte. At special request there can be installed dry-charged storage batteries capable to keep the initial charge within a year from the date of their manufacture

5.6.3.1 Storage battery fastening. Storage batteries 1 (Fig. 107) are placed in container 10 on two side supports and an intermediate support. Upon their installing into the container, the batteries are fastened by two upper clamps 13 and front stop 4. Upper clamps 13 are fixed by front 9 and rear 12 wedge stops. Front wedge stops 9 are adjustable and secured on container cover 6 by bolts 8. Rear stop 12 is welded to the top rear part of container 10. The top rear part of container 10 has welded-on guides 11 for correct setting of clamp 13 relative to stops 9 and 12.



1- storage battery; 2- clip; 3- storage battery brackets; 4- front stop; 5- container reinforcement; 6- container cover; 7- wing nut; 8- bolt; 9,12- front and rear wedge stops; 10- container; 11- guides; 13- upper clamp; 14- lock ring

Figure 107 - Storage Batteries Setup

5.6.4 Lighting and Signaling System

5.6.4.1 Lighting and signaling devices comprise two main headlamps, front and rear lights, license plate light, flood head lamp, reversing light, cab dome lamp, underhood lamp and instrument illumination lamps, pilot lamps located on the dashboard.

5.6.4.3 Sound signaling is performed by high- and low-tone electric signals. The signaling is turned-on by the switch that is installed on the under-steering wheel switches.

5.6.4.2 Turn and braking signaling. The turn indicators are turned-on by the changeover switch mounted on the steering column. When turning the changeover switch handle clockwise, the r.h. turn signaling lamps installed in the front light, the side repeater and in the rear light, are turned on. When turning the handle counter-clockwise, the l.h. turn pilot lamps are switched-on.

The changeover switch is returned in its original position automatically.

The break-in relay provides the flashing light. If one of the lamps, installed in the lights, is faulty, the pilot lamp of the turn indicators on the dashboard does not go ON.

A special switch should be turned ON to make all the turn indicators be flashing (truck emergency state); in so doing a pilot lamp in the handle is on. When pressing the brake pedal, the stop signal lamps of the rear lights are on.

The other sound and light signals are turned on by corresponding sensors or switches.

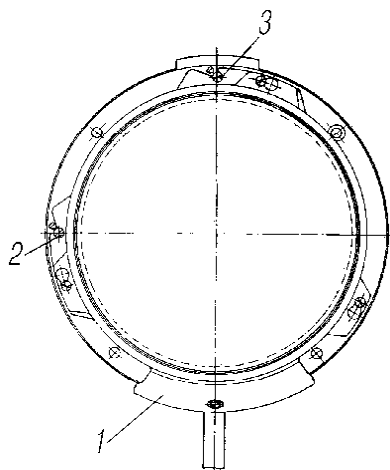
Headlamps adjustment is carried out on fully equipped truck, i.e. the truck should have the full fuel tank and all instruments and auxiliary equipment, accessories.

The wheels should be inflated to the pressure of the complete loading. The truck should be placed for eight hours in the temperature from plus 10 °C up to plus 30 °C.

Headlamps adjustment is the adjustment of the lower beam initial inclination angle.

The lower beam of the headlamps is adjusted with the help of special devices designed for these purposes in accordance with Operation Manuals for those devices.

5.6.4.4 The Headlamps. The direction of light beams is adjusted by two screws available under the lamp rim. Screw 3 (according to Fig. 108) is intended for adjusting the light direction vertically (up and down), and screw 2, horizontally (right and left).



1-outer rim; 2,3-adjusting screws

Figure 108 - Headlamp

For adjusting place the unloaded truck on a flat ground in front of an upright screen at a distance of $(7,5 \pm 0,3)$ mm apart from the headlamp diffuser and, removing rims from both lamps, switch on the light.

Replace blackened bulbs before they burn. When replacing a burn-out bulb, restore the seal in the optical element. Name and specifications of lamps used in the truck are listed in Appendix 7.

The truck is equipped with rear fog lamp intended for the truck marking in the conditions of poor visibility.

Caution! Do not drive the truck with rear fog lamp on in the conditions of clear visibility.

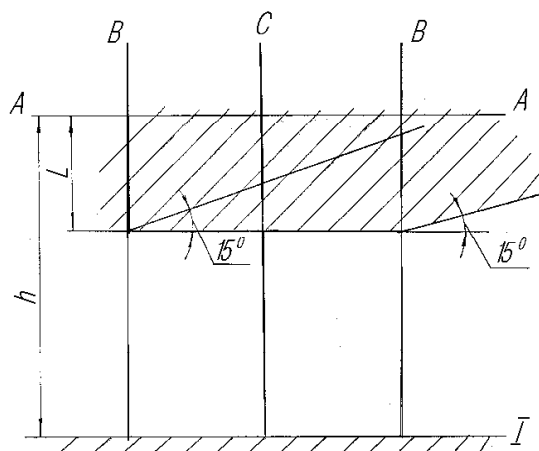
5.6.4.5 Headlamps adjustment. Setting of the initial inclination angle of lower beam light. Headlamps adjustment and control is performed with the help of a screen. The screen can be fixed or portable. The screen should have flat and mat surface. The screen width is not less than 2.5 m.

The screen should be marked by three vertical lines (Figure 109). The central (axial) line corresponds to intersection of central longitudinal screen plane; two other lines to the left and to the right are the lines of the headlamps centers projection. The screen is also marked by the horizontal line A-A. The distance «h» between the line A-A and the site on which the truck is placed is equal to the distance between the headlamp centre and the surface of the site.

The screen plane should be perpendicular to the site plane. Deviation of perpendicularity should not exceed 5 mm for 1 m. The site where measurements are performed should be plain and

horizontal, with roughness height not more than 5 mm and deviation from the plane not more than 5 mm for 1 m. The measurements should be carried out in darkness (e.g. in a dark room).

The ambient temperature during measurements should be from 10 to 30 °C.



I — projection lines of headlamp centers; II — site level; $h = 230$ mm

Figure 109 — Marking of screen for headlamps adjustment

The truck prepared as mentioned above should be placed in such a way that its longitudinal axis plane is perpendicular to the screen plane, and intersection line with the screen plane coincides with the central vertical line on the screen. The distance between the headlamp centers and the screen should be 10 m.

Adjust the headlamps by-turn; non-adjustable headlamp should be covered with black material.

Headlamps adjustment is carried out on fully equipped truck, i.e. the truck should have the full fuel tank and all instruments and auxiliary equipment, accessories.

The wheels should be inflated to the pressure of the complete loading. The truck should be placed for eight hours in the temperature stated above.

The headlamps adjustment means the setting of initial inclination angle of lower beam — 1.9 %.

After the headlamps are switched on the light beam indicates a light zone at the bottom of the screen and a dark zone at the top of the screen, the line dividing light and dark zones is parallel to the line A-A on the left side of the screen and directed at 15° angle upwards from the intersection point with vertical lines of headlamps centers on the right side of the screen.

Rotating the adjusting screws on the headlamp, remove the line dividing the light and the dark zones so that it is 190 mm below the line A-A. Upon performing the above actions the truck meets the requirements concerning the setting of the initial inclination angle of lower beam light.

The adjustment of the initial inclination angle of lower beam light can be performed with the help of special devices designed for this purpose in accordance with their service manuals. Such adjustment is controlled with the help of the screen. If necessary, methods of the headlamp light adjustment by means of special devices should be corrected.

5.6.4.6 Mount and dismount the terminal blocks of actuators and control units with the truck "ground" off only.

The bulbs of the headlamps should be replaced in the following order: turn out the headlamp rubber rim bolts, turn out the optical element rim screws, remove the rim and optical element, re-

move the spring fixing the bulb and replace the bulb. The re-assembly is to be performed in a reverse sequence.

5.6.5 Safety Fuses

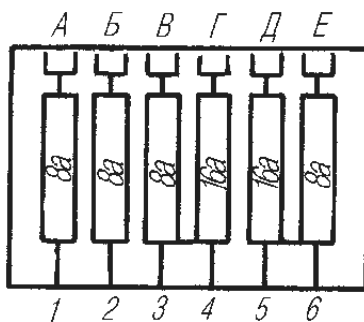
Power-supply circuit is protected against faults (short circuits) by bimetal safety fuse 291.3722 rated at 30 A.

Fuses upper unit shown in Fig. 110, protects:

- 1st link — fog light circuit;
- 2nd link — flooding light lamp circuit;
- 3rd link — portable and under-hood lamps circuit, pilot lamps clusters supply circuit;
- 4th link — circuit of cab dome lamp, road train sign lamps and «stop-signal» lamps;
- 5th link — heater electric motor and reversing lamp circuit;
- 6th link — Instruments and buzzer supply circuit.

Fuses upper unit protects circuits of:

- 1st link — left clearance light;
- 2nd link — right clearance light and instruments illumination;
- 3rd link — left headlamp lower beam;
- 4th link — right headlamp lower beam;
- 5th link — left headlamp upper beam;
- 6th link — right headlamp upper beam.



1-6 links

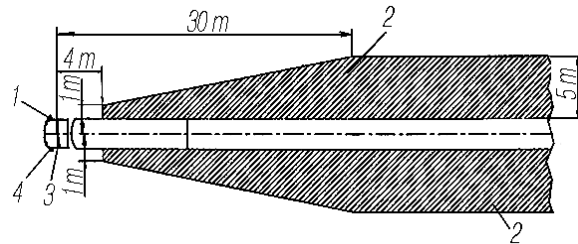
Figure 110 – Safety fuses assembly circuit diagram

5.7 Cab, hood and fenders assembly and platform body

5.7.1 Cab is three-seat one, located behind the engine, with heat and noise insulation, driver and passengers seats, ventilation and heating system, and windscreen heater, sun visors, windscreen wiper, windscreen washer, rear view mirrors on the left and right sides, wide-angle and side-view mirrors.

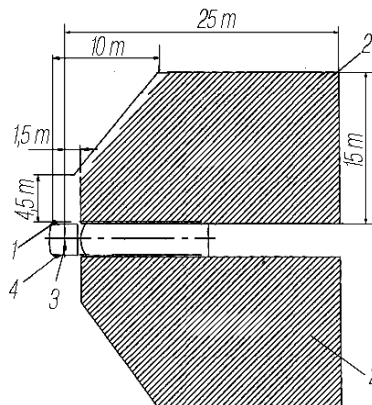
Adjust the spherical mirrors to provide the visibility zones as per Fig. 111, 112, 113, having slackened the bolts fastening spherical mirrors and their holders; then re-fix the bolts securely upon the adjustment.

The cab is fastened to the chassis frame in four points on rubber pads. When the chassis frame deformation occurs, the flexible fastening protects the cab parts from overstress.



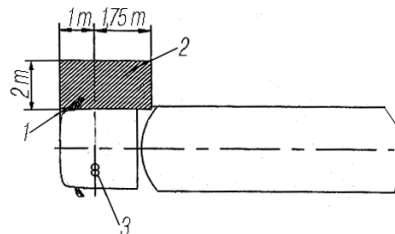
1,4-rear-view mirrors (left, right); 2- road surface visibility zone; 3- driver's eye point

Figure 111 - Visibility Zones Through Exterior Rear-View Mirrors (II class)



1, 4- wide-angle mirrors; 2- road surface visibility zone; 3- driver's eye point

Figure 112 - Visibility Zone Through Wide-Angle Mirror (IV class)



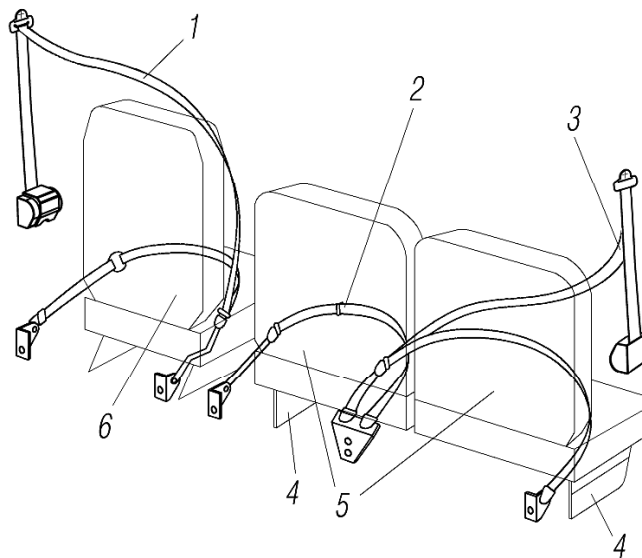
1- mirror; 2- road surface visibility zone; 3- driver's eye point

Figure 113 - Visibility Zone Through Side-View Mirror (V class)

The cab is outfitted with attachment points of driver's & passengers' seat belts. The lower attachment points of the safety belts are on the rear wall of the support 4, as shown in Figure 114, the upper attachment point safety belts are located on the sides of the cab.

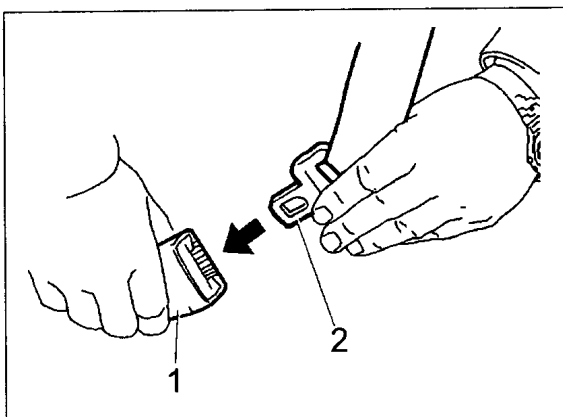
When driving a truck, the driver and the passengers must wear seatbelts.

Safety belts are effective in protecting the driver and the passengers from severe consequences of an accident. To fasten the belt, you need to pull it out gently by holding the belt buckle and insert the buckle 2 in accordance with Figure 115 into the lock 1 till a snap, preventing straps curling. Make sure that the lower strap bear against the hips - lower strap is not allowed to be held around the waist. To release the belt, press the red button on the lock, belt will automatically return to its original position.



1-left safety belt with emergency locking retractor; 2- static safety belt; 3-right three-point safety belt with emergency locking retractor; 4-support; 5-passengers' seat; 6- driver's seat

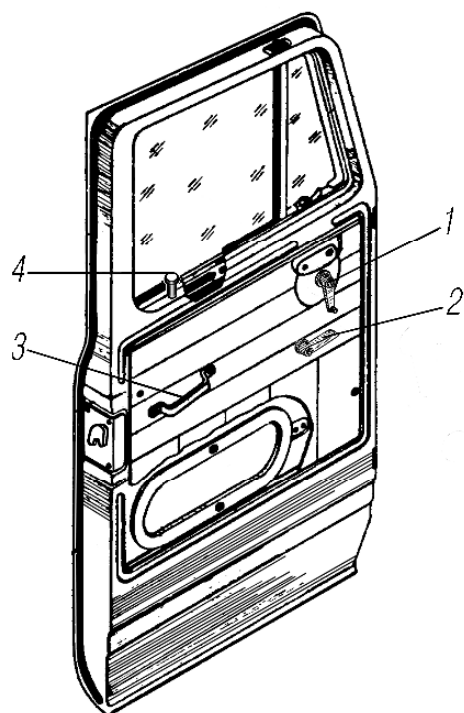
Figure 114 - Safety belts attachment



1-lock; 2-buckle

Figure 115 – Locking a seat belt

5.7.1.1 Cab doors shown in Figure 116 are equipped with locks to close the cab doors and with window lifters. The cab door is locked from the outside by a key and from the inside by a door lock knob.



1-window crank; 2-door open handle; 3-door closing grip; 4-door locking knob (from the inside)

Figure 116 - Cab Door

During the truck travelling, the doors should be closed tight.

If the door rubbers are damaged, glue them up using 88HII glue having dressed the adherent surfaces with an abrasive cloth and wiped with clean cotton cloth moistened in gasoline.

The door windows are equipped with drop-sided and swivel window glasses. The door glasses are lifted and lowered down with the help of lifting gears. The glasses should move in the guides freely, without seizing.

Lubricate all the friction surfaces of lock parts, hinges, fasteners and spring pins with the Литол-24 grease or solid oil, when disassembling.

5.7.1.2 Windshield wiper and windshield washer. The cab is equipped with a windshield wiper and windshield washer. The two-speed windshield wiper consists of electric drive, two rods, wiper blade levers and two wiper blades. The windshield wiper is turned ON by a switch located on the steering column. When the wiper is switched off, the wiper blades are automatically put along the lower edge of glass.

The windshield washer tank with a pump and a motor is mounted on the l.h. side panel of the front end. The washer tank capacity is 2 l. The washing fluid is supplied to the glass via hoses through two spraying nozzles.

The washing fluid supply is controlled by the windshield washer switch located on the steering column.

At the ambient temperature over +5°C filtered water is used to fill the washer tank in. At the ambient temperatures from +5°C down to -40°C it is recommended to use solution of distilled water and sulphanol solution in isopropyl spirit (НИИСС-4 fluid), Specifications 38.10230-76, in the proportions specified in Table 11.

Table 11 - **Concentration of НИИСС-4 water solution depending on the ambient temperature**

Ambient air temperature, 0 °C	Composition by volume in portions	
	НИИСС-4	Water
above +5	0	10
from +5 down to -5	1	9
from -5 down to -10	1	5
from -10 down to -20	1	2
from -20 down to -30	1	1
from -30 down to -40	2	1

Do not use the НИИСС-4 fluid without diluting it by water, because the combined effect of concentrate, atmospheric pollution and ultraviolet rays causes changing of the truck paint-and-lacquer coating.

Flush the glasses together with switching on the windshield wipers. Change the flush direction by turning the guide in the spraying nozzle.

5.7.1.3 Cab heating. The cab is heated by air warmed up in the heater which is integrated in to the engine cooling system. The air supply to the heater radiator from the outside is adjusted with the help of exterior hatch cover 12 (Figure 117) and from the cab – with the help of interior hatch cover 7. If the heater fan operates, the heated air flows into air heating distributor 3 and then into the cab through controllable deflectors.

The deflectors are controlled by lever 4. If the lever is set in its upper position, air is supplied via deflectors 13 to blow onto the glasses; at the lever's lower position, the air is supplied for warming of driver and passengers feet. If the lever position is changed relative to the extreme positions, the air quantity is also changed supplied for blowing over the glasses and for warming the feet.

Interior hatch cover 7 is controlled by lever 5. If the lever is set in its upper position, the hatch is opened; in the lower position, it is shut.

Most favorable positions of the cab heater controls: simultaneous air intake from the outside through hatch controlled by cover 12, from the cab through interior hatch shut by cover 7, supplying the heated air onto the windshields, to the driver and passengers feet if lever 4 has been set in the middle position. The fan switch is located on the dashboard.

Cock 11 mounted on the engine water-feed r.h. pipe should be opened, when operating the truck at the ambient temperatures below zero. In summer disconnect the heater from the cooling system by shutting off the cock 11.

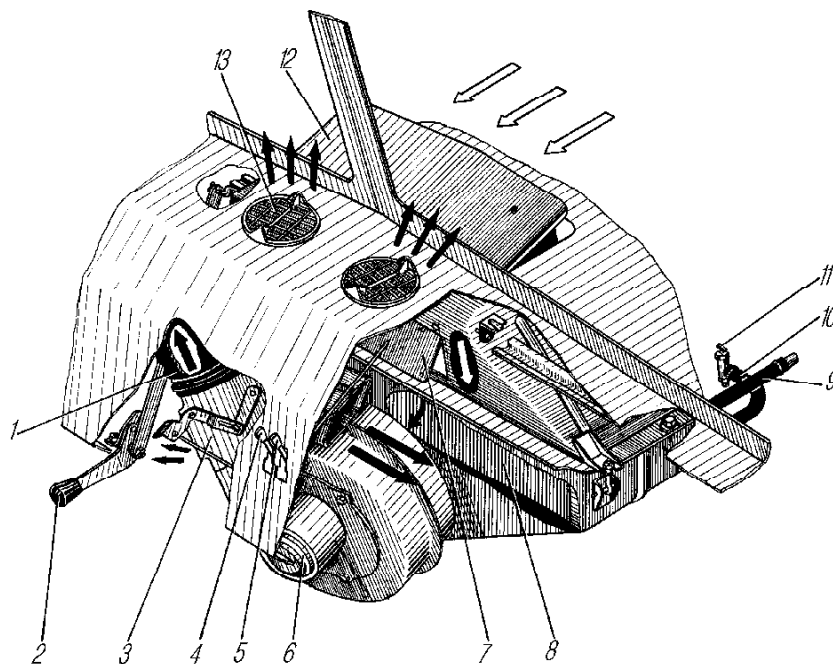
If the water is used as a coolant at the ambient temperatures below zero, prior to filling water in the cooling system, shut off the heater control cock so as to avoid the cold water intake into heater radiator since the water may freeze in the radiator.

The cab is ventilated through hatches of the heating system, apertures of turnable and drop-sided windows of the doors. If the natural air is insufficient for airing the cab, open the exterior hatch and switch ON the fan.

Parking air* heater is mounted on the cab floor on the right side. Fuel is supplied from the preheater tank.

When operating parking heater strictly observe the rules stated in section «Safety requirements» and make use of technical description and installation instructions.

* Upon request

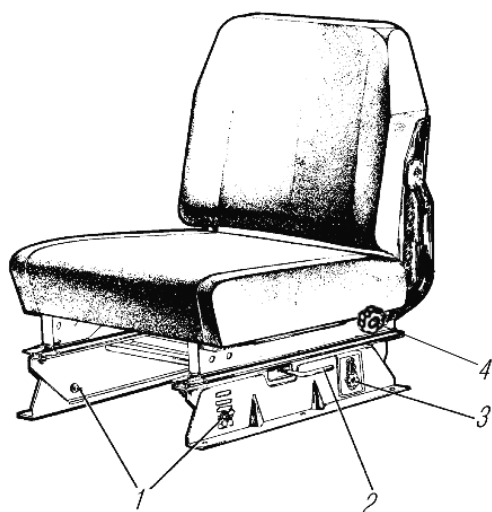


1- hose for windshield blowing with warm air; 2-exterior hatch control lever; 3-air heating dispenser; 4-flap control lever of air heating dispenser; 5-interior hatch control lever; 6-motor and fan assembly; 7-interior hatch cover; 8-heat radiator; 9-heat radiator water outlet pipe; 10-water-supply pipe; 11-cock; 12-exterior hatch cover; 13-deflector

Figure 117 - Cab Heater and Windshield Blowing Diagram

5.7.1.4 The driver's and passengers' seats are of separate design; they have rubber belts as shock-absorbing elements.

The limit of forward and backward adjustment is 110 mm. The seat is fixed in the desired position by handle (as shown in Fig. 118) provided at the left side of the seat support. The driver's seat has a mechanism used for changing seat cushion inclination and position of the seat in height with the limits of adjustment up to 80 mm. To change the position of the seat in height, turn out two front screws 1 on the left and right sides of the seat. Upon setting the desired height of its front part, turn in these screws by several turns, but not tightly, slacken the seat rear part by turning out two screws 3 by four or five turns.



1,3-seat height and inclination adjusting screws; 2-seat back-and-forth movement lever; 4-seat backrest angle wing nut

Figure 118 – Driver's Seat

Upon final adjustment of the seat position, tighten all the screws home. The tapered part of the screw should be fixed in one of five tapered recesses.

The driver's seat backrest may be adjusted in reclining. To change the backrest incline, unscrew wing nut 4, set the backrest in the desired position and tighten the wing nut 4 home.

5.7.2 Hood and fenders

Some units of hood and fender assembly are made detachable for convenient servicing and repairing on the engine. The hood and fender assembly is fastened to the truck frame through a rubber pads and to the cab through rubber buffers. The hood is of alligator-type, to be opened at 90°.

5.7.3 Truck platform body

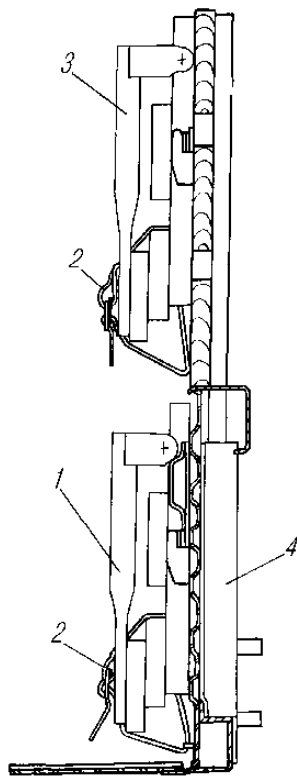
5.7.3.1 The truck platform is metallic, removable one and intended for carrying packaged cargoes, cargoes on the standard pallets and people. The platform is equipped with removable sides and stakes. Tailgate and sides are hinged. Adjustable side locks are placed in the stakes.

The hinged strapping brackets are located on the body bottom along the sides.

The truck platform is equipped with the seats, extension racks for the sides, and top bows with braces and canopy. The middle seat can be demounted and fixed on the front board (see Fig. 119). The side seats can be folded up to provide space for carrying cargoes.

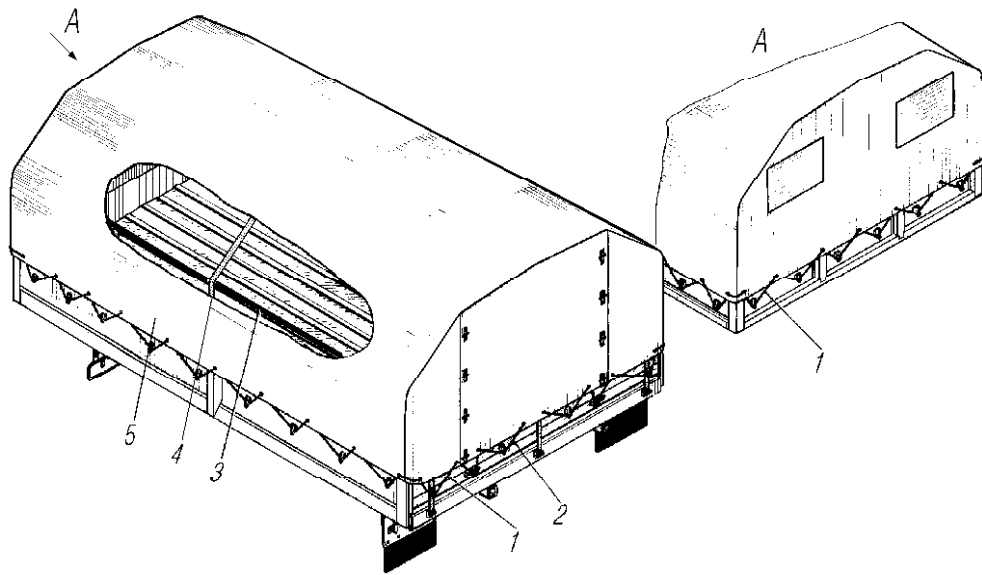
The installed canopy is shown in Fig. 120. The canopy folding sequence is shown in Fig. 121. It is required to dry the canopy prior to its folding.

After a long parking of the truck with a canopy exposed to atmospheric precipitation, start driving only having checked first that there are no substantial volumes of water or snow on the canopy-roof which can injure other participants of the traffic.



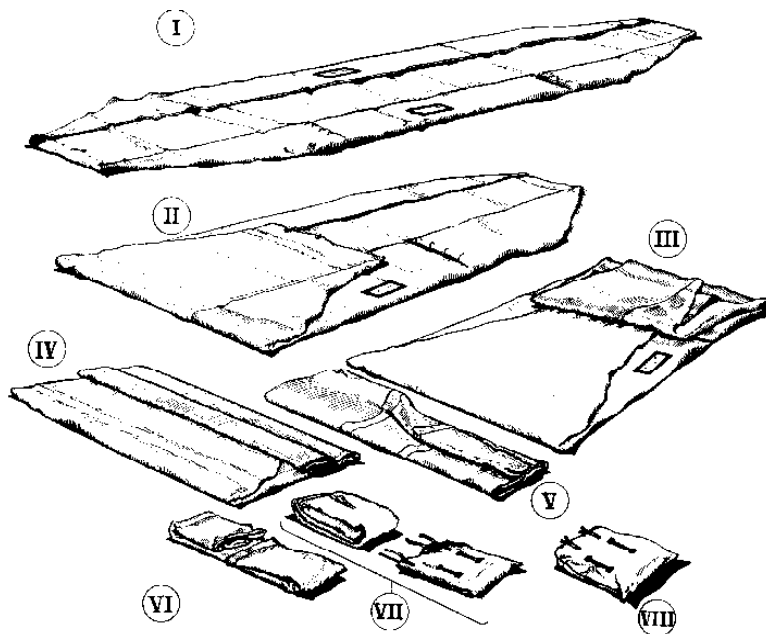
1-rear middle seat; 2-fastening belt; 3-front middle seat; 4-platform front board

Figure 119 – Middle seat folding



1-canopy fastening rope; 2-tent fastening rope; 3-top bow; 4-top bow distance tube; 5-canopy

Figure 120 – Truck Platform with Canopy



I-VIII- folding steps

Figure 121 - Canopy folding sequence

5.7.3.2 Platform sides lock mechanism adjustment. The purpose of adjustment is reliable locking of the sides and fixing the locks' handles in CLOSED position.

The adjustment is performed according to the scheme shown in Fig. 122.

The direction and the amount of the catch 1 movement in the stake 2 body are sized up on the basis of the following:

1. If after the complete closing of the side and locking of the stake the side can move freely in the direction of opening, shift the catch 1 upwards.

2. If the effort on handle 7 during locking exceeds 300 N (30 kgf), or if the handle does not reach its upright position or fails to stop in this position the catch 1 should be shifted downwards.

3. The amount of the necessary movement in each case should be defined visually.

To perform adjustment:

1. Shift handle 7 into OPEN position.

2. Remove screw 5 with the spring washer 4.

3. Push the pusher pin 6 out of the handle 7 hole.

4. Let the pusher 3 out of the handle 7 slot.

5. Rotating the pusher 3 around its axis by the whole number of turns, move catch 1 by the required amount in the required direction (one turn of the pusher corresponds to the catch movement by 2 mm):

-turn in the pusher 3 to move catch 1 downwards;

-turn out the pusher 3 to move catch 1 upwards;

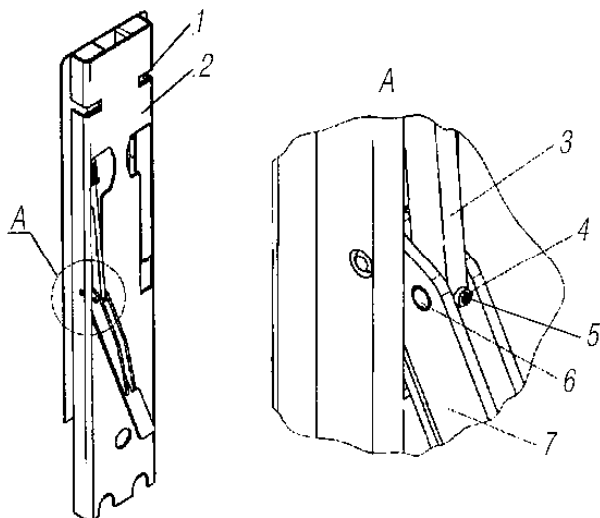
6. Insert the pusher 3 into the slot of the handle 7, matching the hole on the handle with the one on the pusher.

7. Insert the pusher pin 6 into the hole of the handle 7, matching the threaded hole of pin with the pusher 3 hole.

8. Check if the adjustment is correct by closing the side and locking the stake. Repeat points 1, 2, 4–9 if required.

9. Shift handle 7 into OPEN position.

10. Turn in the screw with the spring washer 4 into the threaded hole of pusher 3.



1-catch; 2-stake body; 3-pusher; 4-spring washer;
5-screw; 6-pusher pin; 7-handle

Figure 122 – Platform body stake with adjustment mechanism

5.7.3.3 Side safety guards (SSG), shown in Fig. 123, provides effective protection of vulnerable road users from falling down under the vehicle from the side along the whole length of the vehicle.

On the vehicle there are left side and right side safety guards each of them consisting of two parts: front (under the cab) and rear (behind the cab).

Before lowering the spare wheel holder, remove rear right side safety guard:

- screw out bolts fastening side safety guard brackets to the upper connecting braces located on the inner side of the guard;

- remove SSG from the brackets lower hooks.

Re-mount rear guard in the reverse order.

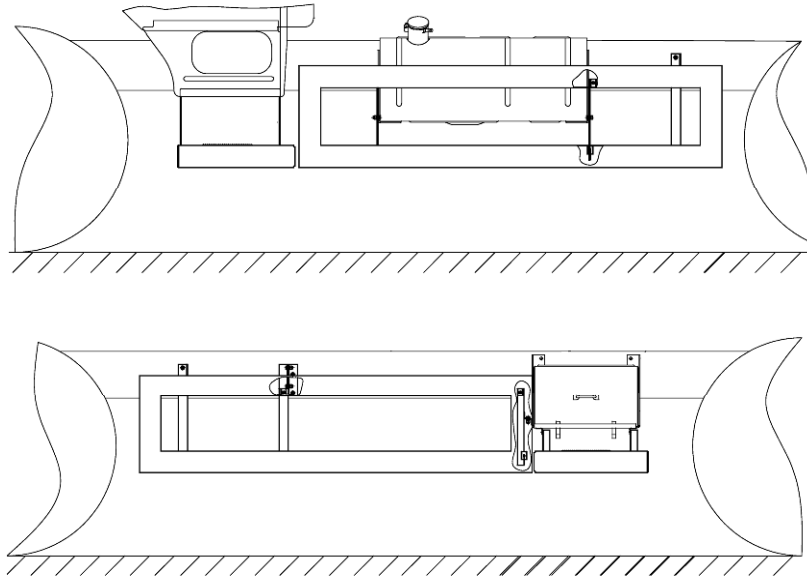


Figure 123 – Left side and right side safety guards

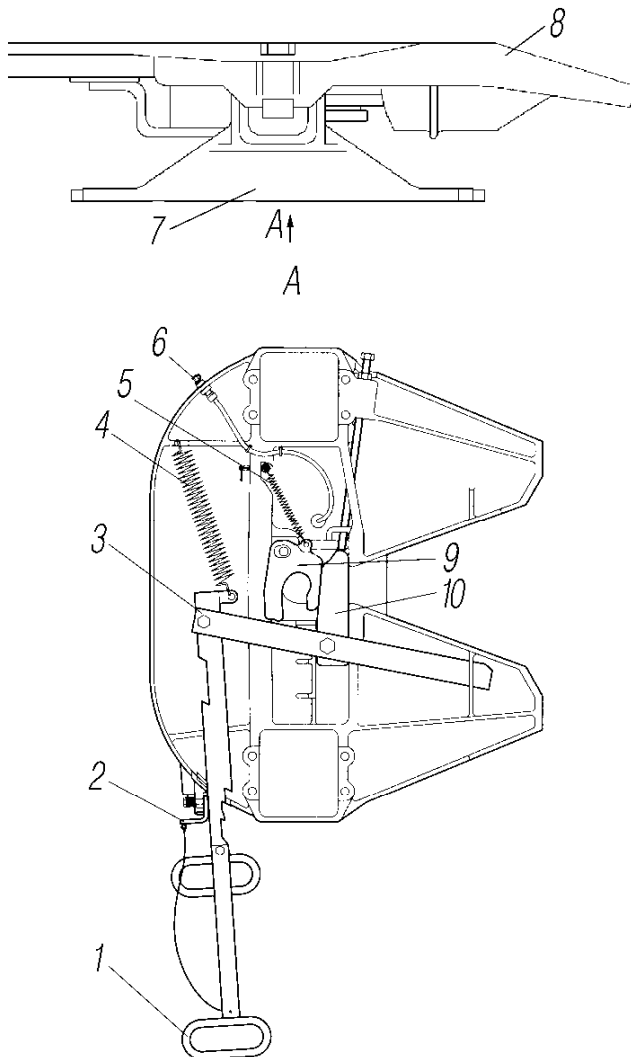
5.8 Bolster unit

The truck tractor has bolster unit designed for articulating the truck tractor with the semitrailer having hitching pivot of 50 mm diameter; for transferring tractive effort from the tractor to the semitrailer; for providing the tractor semiautomatic hitch and unhitch with the semitrailer

Bolster unit consists of bolster 8, see Fig. 124, carriers 7 and the release-hitch mechanism. Rubber cushions located in the joint of the bolster and the carriers ensure bolster rocking in longitudinal and lateral planes and reduce dynamic loads.

5.8.1 Release-hatch mechanism is located under the bolster and shown in view «A» (carriers 7 omitted for clarity). When pulling the unhitching control handle 1 the locking bar 10 releases locking hook 9 via lever 3; the hook turns to the position for hitching by spring 5 force. When releasing the handle the locking bar 10 holds the locking hook 9 by spring 4 force.

At the hitching the semitrailer pivot turns the locking hook 9. The lock 10 and the handle 1 move to the closed position under the force of spring 4. Self-release safety lock 2 fixes handle 1 in that position.



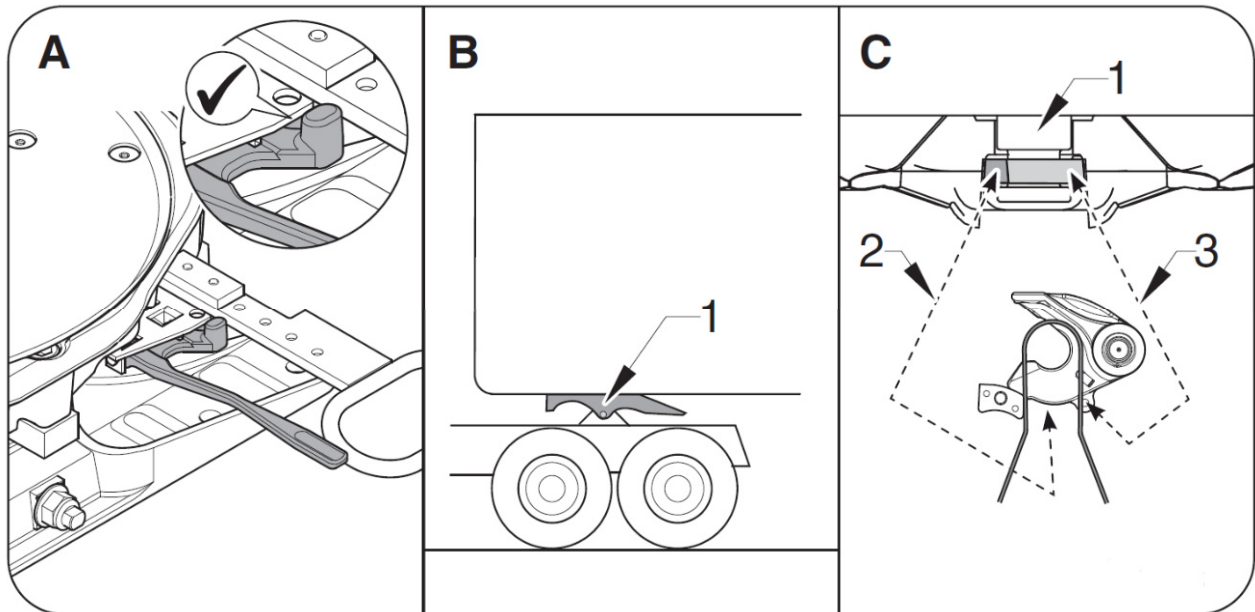
1-unhitching control handle; 2-self-release safety lock; 3-lever; 4-spring; 5-spring; 6-pipe; 7-carrier; 8-bolster; 9-locking hook; 10- locking bar

Figure 124 – Bolster Unit

5.8.2 Bolster unit maintenance

Before a departure:

1. Check the safety lever to be in closed position.
2. Check the bolster unit and the subframe for secure fixing, absence of wear, corrosion and defects.
3. Check the hitch locking to be secure and complete in accordance with Fig. 125.
4. Perform standing start test: apply bolster trailer brakes and standing start the truck tractor slowly – bolster trailer shall not unhitched.



1-central journal; 2, 3-locking element; A – release handle is fixed in the unit plate and safety lever stub is in front of release handle completely. B – no clearance between bolster unit and bolster trailer; C – locking element 3 securely locked on the central journal 1

Figure 125 – Hitch locking control

5.8.3 Hitching and unhitching of the truck tractor with the semitrailer

Before hitching make sure that the bolster unit and its fasteners are in good working order; the bolster is free of dirt and foreign particles; clean the upper surface of the bolster, is required and apply fresh grease. Apply the semitrailer parking brake and set the semitrailer on the bolster so that the semitrailer rest plane is in the same level with the truck tractor bolster above the ground surface or lower than the bolster by 50 mm max.

For hitching and unhitching select a flat horizontal hard-surfaced site. Set the truck tractor and the semitrailer longitudinal axes aligned in the same straight line.

Perform the hitching in the following order:

- check that bolster locking element is lifted completely and locking element handle is in the position ready for locking shown in Fig. 126.

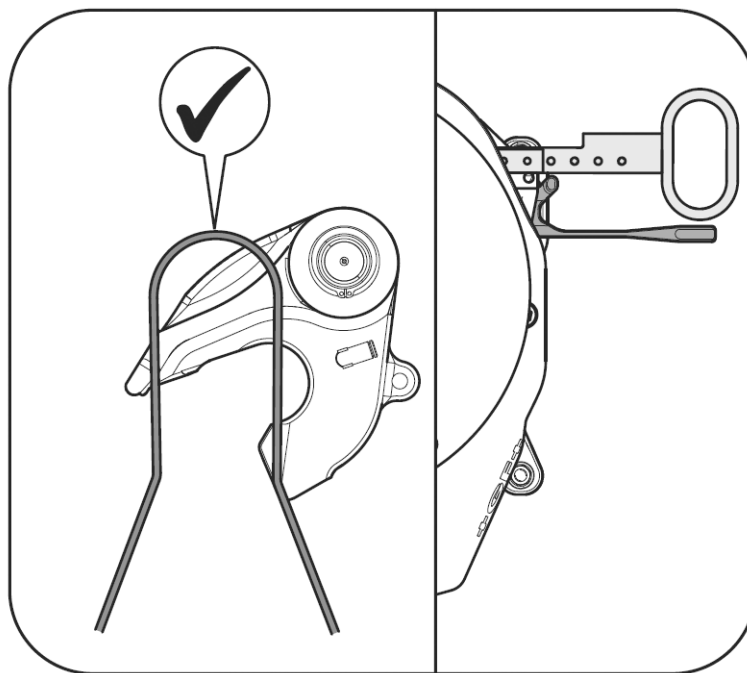


Figure 126 – Locking element in «open» position

- free some space between truck tractor and semitrailer;
- drive the truck tractor backward slowly to the semitrailer so that the semitrailer pivot enters into the grips of the bolster. The truck tractor and the semitrailer are hitched automatically;
- apply the truck parking brake. Check that the self-release safety lock 2 (Fig. 124) pushed down and prevents the lever from being pulled;
- lift the semitrailer support in the extreme top position and fix it securely;
- plug the semitrailer power cable in the socket;
- connect the truck brake air hose to the connecting heads of the semitrailer;
- release the semitrailer parking brake;
- drive the road train forward for some distance; make sure that the truck tractor and the semitrailer have been hitched properly, the brakes and electrical equipment of the semitrailer are in good working order.

When hitching the truck tractor with semitrailers of different brands, adjust the distance between the clips on the hoses to prevent them from tearing resulting from the friction on the projecting parts of the truck.

Prior to unhitching select the flat site for semitrailer parking.

Perform the unhitching in the following order:

- apply the semitrailer parking brake;
- lower the semitrailer support until it rests on the ground in order to unload truck tractor springs. In case of emergency unhitching on the soft ground, place the pads under semitrailer support;

- unplug the semitrailer power cable from the socket;
- disconnect the coupling heads of the brakes air drive (first – feeding line, then – control line) and close them by protective covers. Fix the coupling heads together with hoses on the truck tractor platform;
- shift self-release safety lock 2 in the upper/lower position (depending of the bolster brand) and pull the releasing lever until it is fixed; the locking bar 10 moves aside opening the locking hook 9;
- engage the first gear in the gearbox and drive the truck tractor slowly forward until it is unhitched fully from the semitrailer;
- locking hook 9 remains open with the help of spring 5.

5.9 Special equipment

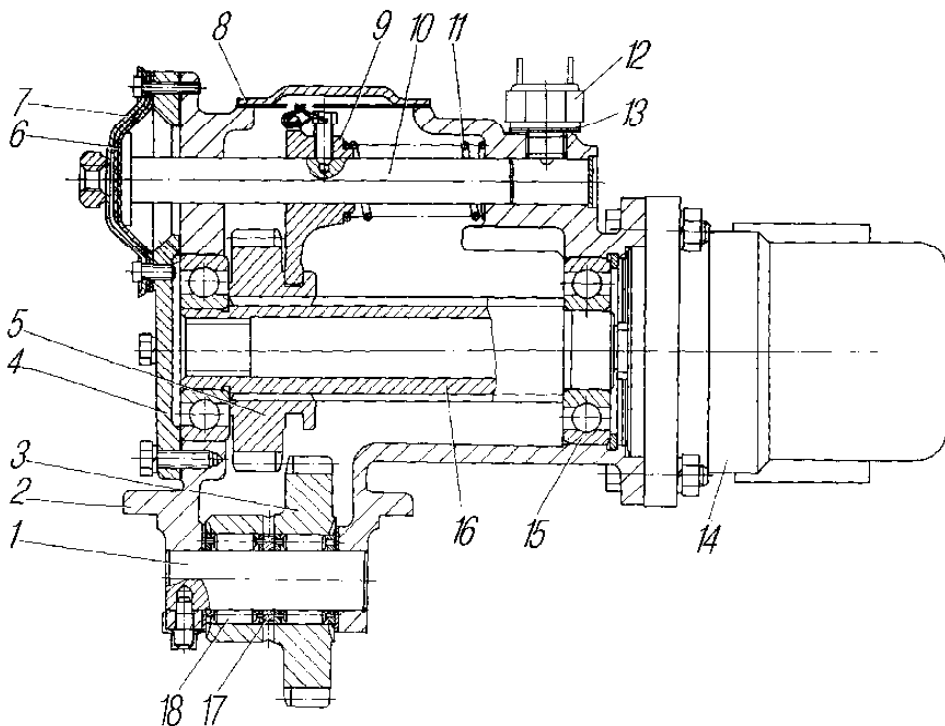
Lay-out of auxiliary units, their drives and power take-off modes should be agreed with the manufacturers. Propeller shafts installed by a customer for driving auxiliary units should have disbalance of not more than 40 g.cm and the effort of shifting in splined joints of no more than 150 N (15 kgf).

5.9.1 Power Take-off

The power take-off (PTO) is single-speed one, fastened to the right side of gearbox housing and designed for driving auxiliary units. There are two versions of power take-off: with a pump (see Figure 127) and with a flange (see Figure 143).

Engage power take-off at the air pressure of 500 kPa (5 kgf/cm²) minimum in truck air system and disengaged clutch. Adjusting shims are installed between flanges of the gearbox housing and power take-off housing. The side clearance in gear meshing is adjusted (by noise) with the help of the above mentioned shims. If it is required to change the old shims by the new ones, their thickness should be kept unchanged.

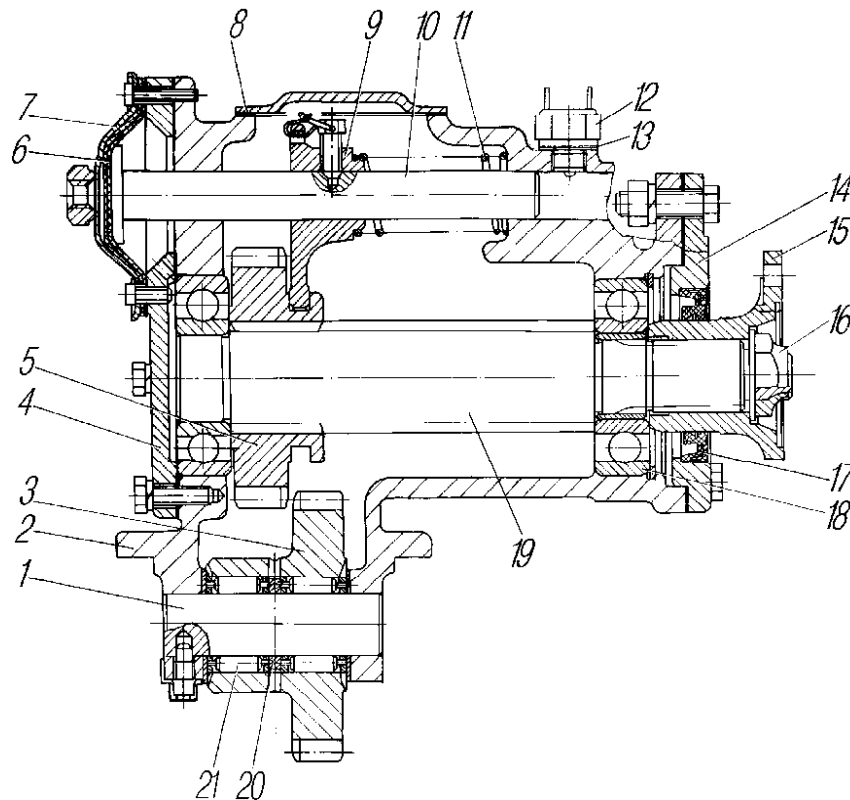
Information about power take-off control is presented in the subsection «5.2.2 Transfer case».



1-drive gear shaft; 2-housing; 3-drive gear; 4-housing cover; 5-driven shaft gear; 6-engaging chamber diaphragm; 7-engaging chamber cover; 8-cover; 9-fork; 10-shift fork rod; 11-spring; 12-switch; 13-adjusting shims; 14-pump; 15-ball bearings; 16-driven shaft; 17-bearing spacing ring; 18-roller bearings

Figure 127 - Power Take-Off with Pump

When the power take-off is engaged the compressed air is supplied to the diaphragm chamber of the engaging mechanism via air lines. Diaphragm 6 (see Figures 127,128) via rod 10 with fork 9 meshes driven shaft gear 5 with drive gear 3. The rod 10 acts on the switch 12, closing its contacts and the power take-off engagement indicator on the dashboard lights up. When the power take-off is disengaged, solenoid valve shuts off compressed air supply and connects chamber of the power take-off engaging mechanism with the atmosphere; the air is let out of the chamber, and the rod 10 with fork 9 under the action of the spring 11 brings driven shaft gear 5 out of mesh with drive gear 3.



1-drive gear shaft; 2-housing; 3-drive gear; 4-housing cover; 5-driven shaft gear; 6-engaging chamber diaphragm; 7-engaging chamber cover; 8-cover; 9-fork; 10-shift fork rod; 11-spring; 12-switch; 13-adjusting shims; 14-cover; 15-flange; 16-nut; 17-collar; 18-ball bearings; 19-driven shaft; 20-bearing spacing ring; 21-roller bearings

Figure 128 - Power Take-Off with Flange

5.9.2 Auxiliary Power Take-Off

The power is taken off the primary shaft of the transfer case via movable coupling 2 (see Figure 129) and is intended for driving the winch.

Auxiliary power take-off can operate at any transfer case gear-shift, including the neutral one. For lubrication of the gear and shafts bearings, a plunger pump is installed in the casing.

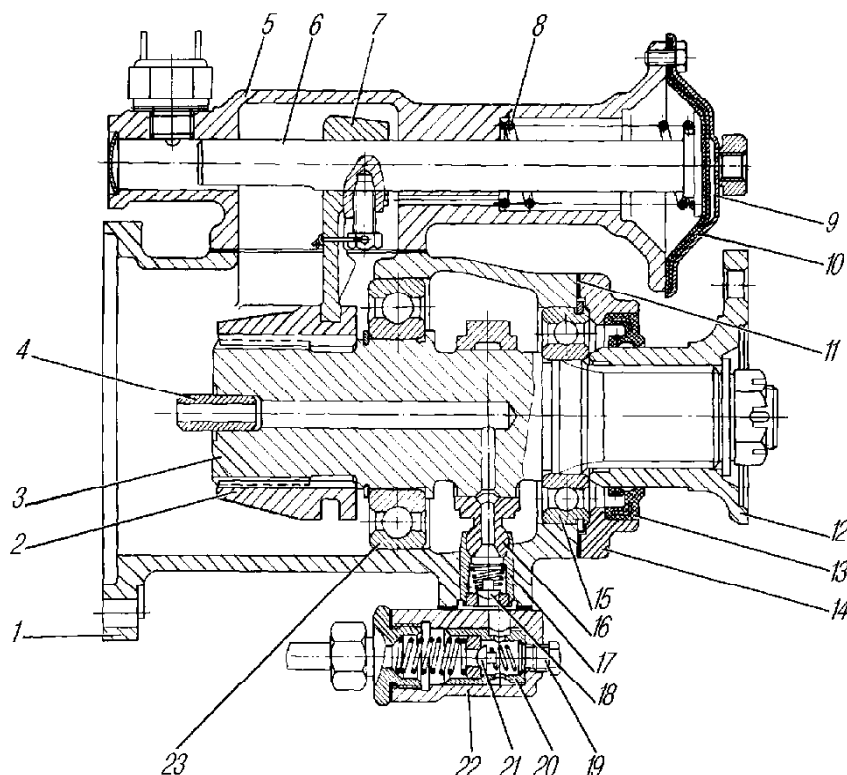


Figure 129 - Auxiliary Power Take-Off

1-housing; 2-coupling; 3-shaft; 4-shaft bushing; 5-engaging chamber body; 6-engaging rod; 7-fork; 8-spring; 9-cover; 10-diaphragm; 11-gasket; 12-flange; 13-collar; 14-cover; 15,23-ball bearings; 16-pump connecting rod; 17-piston; 18, 21-pump valves; 19-plug; 20-safety valve; 22-pump body

The pump consists of piston 17 with delivery valve 18, safety valve 20 and body 22. The piston with the connecting rod is mounted on the eccentric of shaft 3; the piston performs translational motion as the shaft rotates. To prevent an excessive pressure rise with increasing rotational speed, the suction valve is of differential type and has a cylindrical spring. The oil is taken from the transfer case oil sump through a pipe and then the pump forces oil to the gear bearings via channels in shaft 3 and in primary shaft of the transfer case. Some oil penetrates through the gaps and lubricates the shaft bearings.

Information about auxiliary power take-off control is presented in the section «5.2.2 Transfer case», subsection «5.2.2.3 Transmission units control».

When the auxiliary power take-off operates for a long time, the bearings of the transfer case primary shaft and those of the power take-off shaft should not overheat. Overheating indicates some fault in the oil pump.

The pump working order should be checked by two persons as follows. To check pumping action:

- pull the parking brake lever as far as it will go;
- set the transfer case lever to the neutral position;
- disengage the winch by lowering the lever on the frame r.h. side member;
- screw out plug in the pump body;

- start the engine, engage the auxiliary power take-off and one of the gears in the gear-box;

- check operability of the pump by closing plug hole with your finger.

If the pump is in good working order, you will feel oil pulsation in the plug hole.

Do not operate the PTO if the oil pump is faulty.

5.9.3 Winch

The winch (see Figure 130) is designed for the self-recovering as well as for recovering vehicles and trailers on heavy roads. It consists of a worm-type reduction gear unit, drum with wound-on wire rope and a winch rope winding guide.

The reduction gear unit mechanism consists of globoid pair with ratio of 31:1. Worm wheel 20 is riveted on the hub that is able to mesh with drum shaft 10 via movable coupling 22.

Automatic band brake 1 (see Figure 131) is mounted on the reduction gear worm. The brake prevents spontaneous rotation of the winch drum and winch rope unwinding, when the truck clutch is disengaged or if the safety pin has been sheared off.

The brake should be adjusted, when the reverse gear is engaged and the drum movable coupling is disengaged. If the brake overheats to a temperature your hand could not bear (about +60°C) during 1-3 minutes, undo the band fastening nut 3 and lock nut 4 by two or three turns.

5.9.3.1 Adjusting the winch reduction gear unit. Adjust the reduction gear bearings, if axial clearances are formed in them, as well as when a new worm pair is installed.

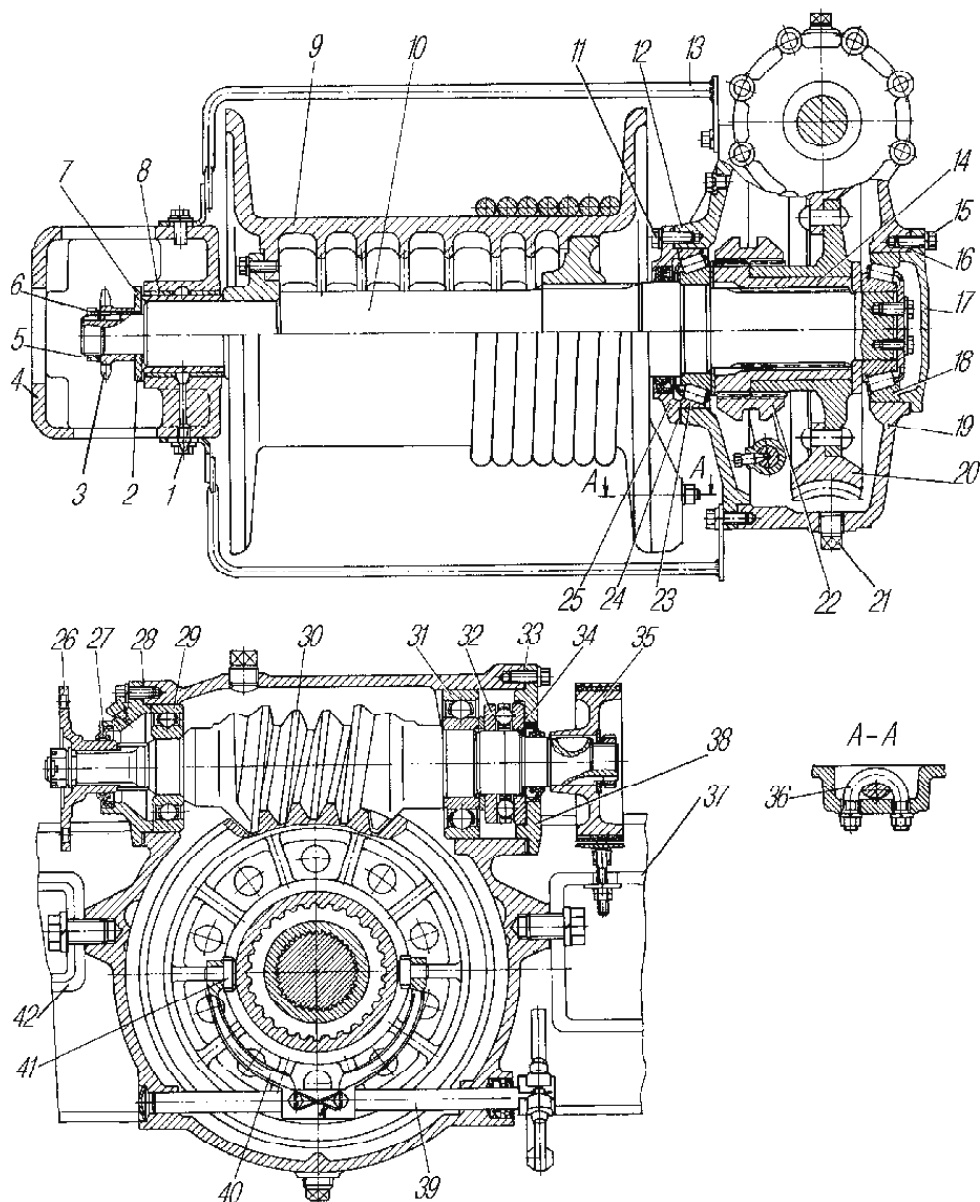
Adjust the bearings if only you fail to eliminate the axial clearance by re-tightening the bearing cap bolts. The bearings must be re-adjusted with preload.

The torque required for cranking the reduction gear worm in bearings 29, 31 and 32 (see Figure 130) should be about 1.0-2.5 N.m (0.1-0.25 kgf.m). If the shaft turns rather easily or if it has an axial clearance, remove some of adjusting shims 28 and 33 of the same thickness from under the front and rear bearing caps. If torque more than 2.5 N.m (0.25 kgf.m) is required to crank the shaft, add adjusting shims of the same thickness under the bearing caps. When checking the worm shaft torque, the bolts fastening bearing caps should be tightened home.

Quantity of the adjusting shims placed under the rear and front bearing caps should be approximately the same after the adjustment; that facilitates further adjustment of the worm pair for meshing.

Adjust the worm wheel shaft tapered bearings by changing the number of adjusting shims 16 and 24 under the bearing caps.

The preload allowance of the worm wheel shaft bearings should be checked, when the shaft has been meshed with the worm. The torque required for cranking the worm wheel shaft in the bearings should be 3-6 N.m (0.3-0.6 kgf.m). Upon readjusting the bearings, check whether the worm pair is meshed correctly, using paint on the teeth contact pattern. If the pair has been adjusted correctly, the tooth working face print (when the wheel is unloaded) is located in the tooth centre and makes at least 5 mm in width and 2/3 in height of the tooth.



1-lubricator; 2-thrust washer; 3-sprocket; 4-drum shaft bracket; 5-nut; 6-lock washer; 7-sliding bearing; 8-spacer; 9-drum; 10-drum shaft; 11,15-bolts; 12-reduction unit cover; 13-rope railing; 14-fixed coupling; 16,24,28,33-adjusting shims; 17,25,27,38-bearing caps; 18,23,29,31,32-bearings; 19-reduction unit case; 20-worm wheel; 21-plug; 22-movable coupling; 26-flange; 30-reduction gear worm; 34-gasket; 35-band brake; 36-rope fastening clamp; 37-lead screw bracket, r.h.; 39-coupling rod; 40-fork; 41-slide block; 42-winch suspension cross-member

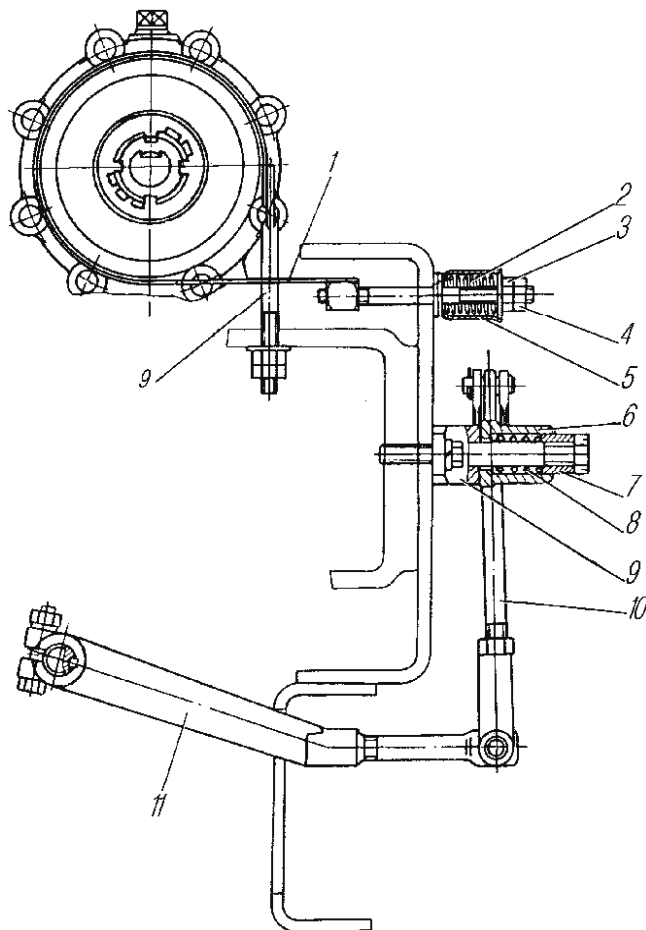
Figure 130 - Winch Reduction Unit

To change the contact pattern in height of the tooth, shift worm 30 axially using adjusting shims. To displace the contact pattern to the tooth root, remove several adjusting shims 28 from under the bearing cap 27 at the flange side; to displace the contact pattern to the tooth end, add shims. Change the number of adjusting shims 33 under the bearing cap 38 at the brake side correspondingly, so that the total thickness of adjusting shims at both sides remains the same. The contact pattern is displaced along the tooth width by the axial displacement of the worm wheel in the same direction, where the pattern is displaced to.

The globoid worm pair can operate properly only if the meshing has been adjusted correctly.

Incorrect adjustment may cause overheating of the worm pair and rapid wear of worm wheel teeth.

Winch control is shown in Fig. 131.



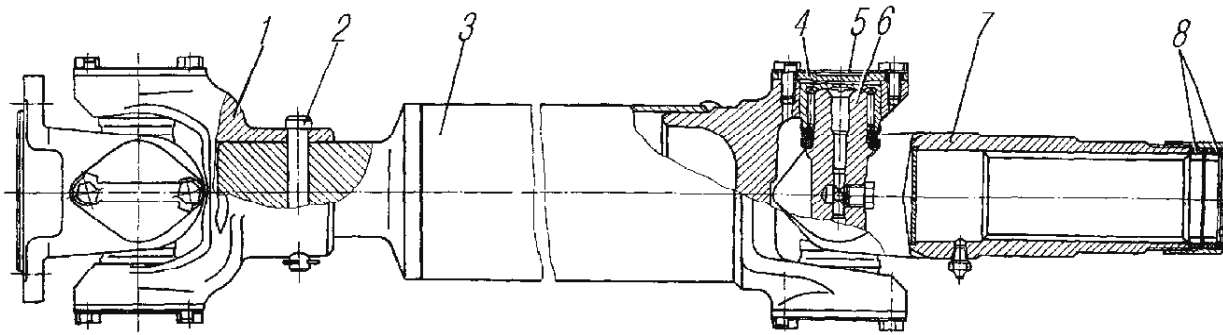
1-band brake; 2,8-springs; 3-nut; 4-lock nut; 5-press-over coupling; 6-winch control lever; 7-bush; 9-bracket; 10-rod; 11-winch engaging lever

Figure 131 - Winch Control

5.9.3.2 Winch drive. Power taken off the transfer case is transferred via auxiliary power take-off to the winch reduction gear by three cardan shafts. To protect the winch parts against overload, safety pin 2 (Figure 132) is fitted in the front cardan shaft, which would be sheared off if the winch is overloaded.

All cardan shaft joints have of identical design and are unified with those of GAZ-53A truck.

The intermediate cardan shaft is mounted on two supports. To compensate errors in mounting, sliding forks 7 of the front and rear shafts enter the splines provided in the ends of the intermediate cardan shaft. Lubricant in the splined joints is held by sealing rings 8.



1-universal-joint fork; 2-safety pin; 3-cardan shaft; 4-needle bearing cap; 5-locking plate; 6-universal-joint cross; 7-sliding fork; 8-sealing rings

Figure 132 - Front Cardan Shaft of Winch Drive

5.9.3.3 Rope winding guide. The winch is equipped with a winch rope winding guide which provides proper rope winding on the drum even if the drum deflects relative to the truck axis at 15° maximum. The rope is fastened on the drum by a clamp and it is paid out backwards only. The guide roller holder case 22 (Fig. 133) lays over the rope, reciprocating along the lead screw 6 and along two guide rollers 7. The l.h. and r.h. threaded screw mounted in two bearings is driven via a chain transmission from the drum shaft through driving 16 and driven 10 sprockets. Chain tension is adjusted by adjusting shims 2 and 14; the chain sagging is 3-10 mm.

Axial force from lead screw 6 is transferred to the guide roller holder case via slide block 20 of lead screw. The slide block is installed in the guide roller holder case and fixed with cover 21. Guide rollers 19 are installed on the polyamide bushes 18 and rotate on the pins 17 locked by plate 5.

5.9.3.4 Rules for using the winch. Prior to operating the winch, check that the drive for engaging and disengaging the winch drum operates correctly; also check that the rope is wound correctly and is fastened reliably. If the drive is adjusted properly, the length of rod 10 (see Figure 131) between the axes of the holes in the adjusting forks should be 228-232 mm.

If it is difficult to engage the winch drum during a cold season, it is required to warm up the winch reduction gear in idle running during 3-5 min.

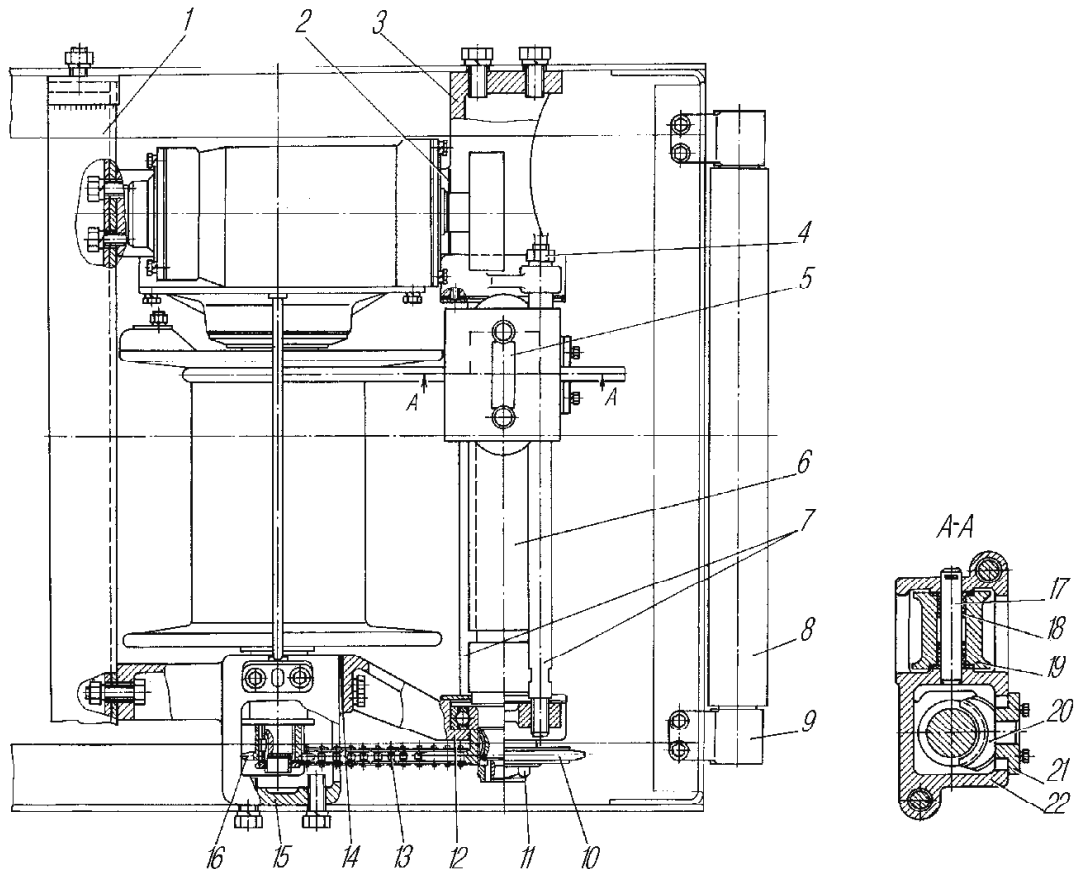
Do not use the winch rope for towing a truck or a trailer or if the rope angles of deflection relative to the truck center line exceeds 15°.

To engage the winch:

- set the transfer case and gearbox levers in the neutral position;
- using a 30 mm wrench, set the movable coupling lever in the upper position ("ON"), when the rope is forced out. For paying out the rope by hand, set the movable coupling lever in its lower position ("OFF");
- release the lock and shift the auxiliary power take-off lever forward to the stop;
- engage the first or second gear and unwind (pay out) the rope of the required length; choose the rope sagging by hand. Before pulling check that at least three or four rope coils are left on the drum;

- engage the reverse gear to pull cargos;
- throw into reverse gear in the gearbox and lower speed gear in the transfer case for self-recovering of the truck.

Increase the engine speed smoothly. Abrupt acceleration of the engine does not result in increasing the rope pulling force, but may cause a shear-off of the safety pin. If the safety pin is sheared off, immediately disengage the drive and shift the gear shift lever in the neutral position; otherwise, the shaft may be seized in the flange. Replace the sheared-off safety pin by the new one.



1-winch cross member; 2,14-chain tension right- and left-hand adjusting shims; 3,12-lead screw right- and left-hand brackets; 4,11-nuts; 5-locking plate; 6-lead screw; 7-guide rolls; 8-horizontal roller; 9-horizontal roller bracket; 10,16-driven and driving sprockets; 13-chain; 15-drum shaft bracket; 17-guide roller pin; 18-bush; 19-guide roller; 20-slide block of lead screw; 21-slide block support cover; 22-guide roller holder case

Figure 133 - Winch Rope Winding Guide

Do not use bolts or other parts as the substitute of the safety pin.

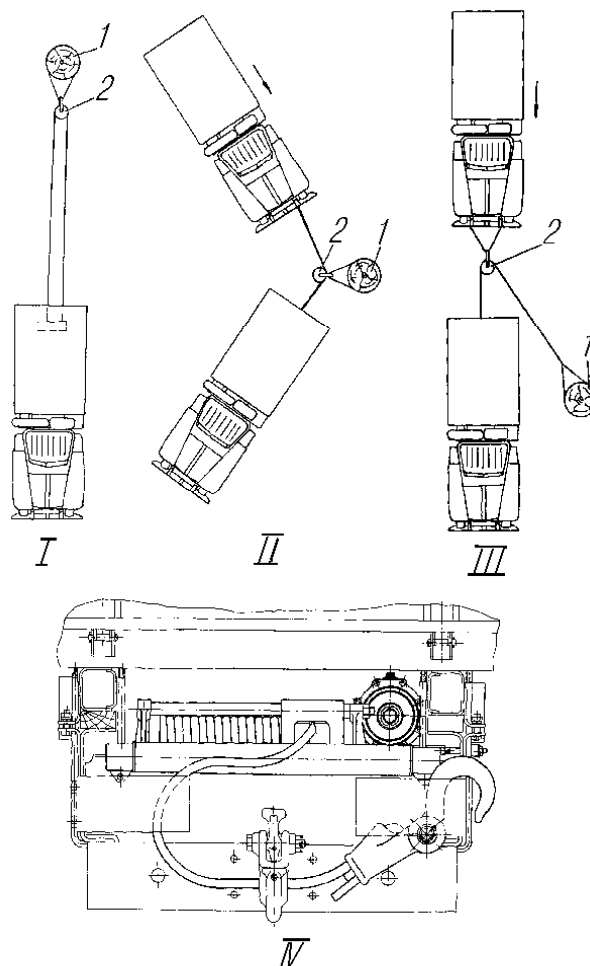
When operating, it is difficult to determine the rope towing force; therefore, before using the winch, estimate probabilities of using the winch pulley proceeding from the specific conditions.

Use of the winch with the pulley is shown in Figure 134. For winch rope drawing through the pulley, it is required to uncotter and to unscrew the nut on the lower pulley shaft with the spacer, pull the shaft, put the rope into the pulley groove, re-insert the shaft and fasten the nut. When the winch pulley is not supplied with a hook, use the towing rope supplied with the truck.

When the pulley is used to increase the pulling force for self-recovering (position I), it must be fastened with the towing rope to a fixed object selected as a support and the winch rope hook, to the truck towing hook. When the pulley is used to change the rope direction for recovering of another truck (position II), fasten it with the help of towing rope to a fixed object selected as a support and the winch rope hook, to the towing hook of the truck to be pulled out. When the pulley is used to increase the pulling force for recovering of another truck (position III), fasten the pulley to the towing hook or towing rope on the recovery truck towing hook and the winch rope hook, to a fixed object by means of the second towing rope. It is possible to fasten the winch rope directly to the fixed object, in so doing the hook is fastened to a preliminarily tightened rope.

To avoid overheating of the winch reduction gear do not pull the cargo, using the whole length of the rope more than three times in sequence at the maximum load or the load close to it.

Lay out the winch hook in the transport position (position IV).



II-изменение направления силы тяги при вытаскивании автомобиля; III-увеличение силы тяги при вытаскивании автомобиля; IV-укладка троса в транспортном положении
1-fixed object; 2-winch pulley; I-pulling force increase for self-recovery; II-pulling force direction change for recovering of trucks; III-pulling force increase for recovering of trucks; IV-folding of rope in transport position

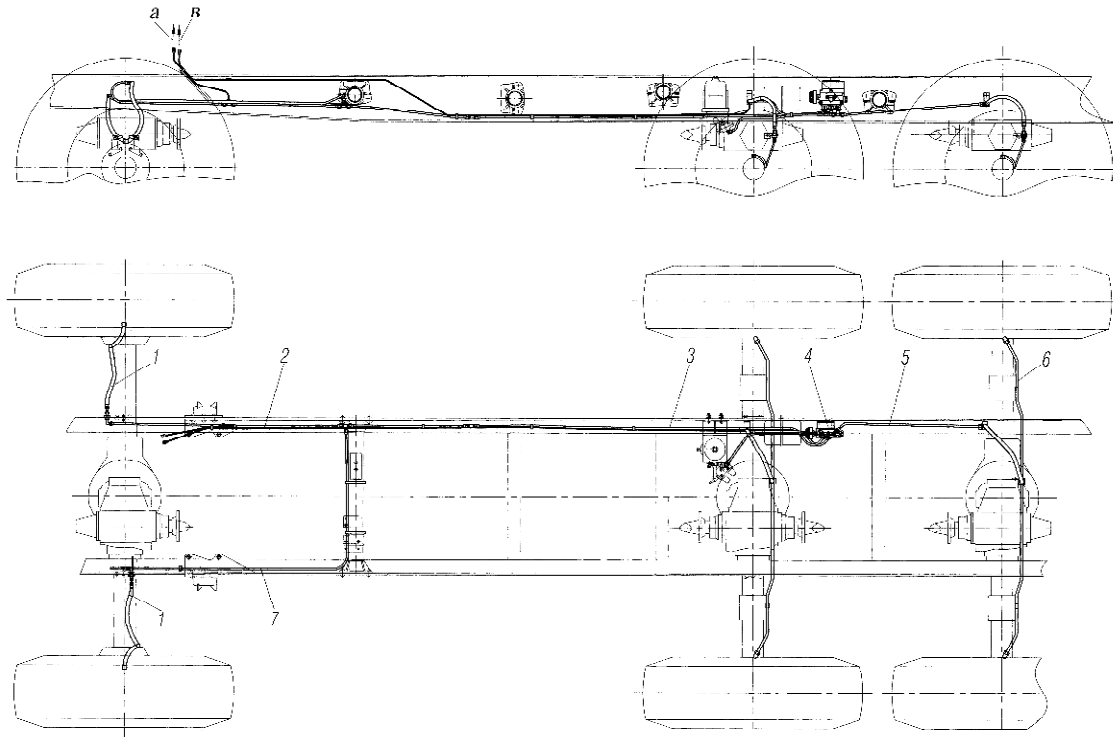
Figure 134 - Winch Pulley Application

5.9.4 Tire Air Pressure Control System

The tire air pressure control system shown in Figures 135 and 136 allows to control and maintain the tire air pressure within the required norm as well as to increase cross-country ability of the truck by reducing the tire pressure. It allows to drive the truck with a punctured tire without changing the wheel (**the wheel valves of intact wheels should be closed**).

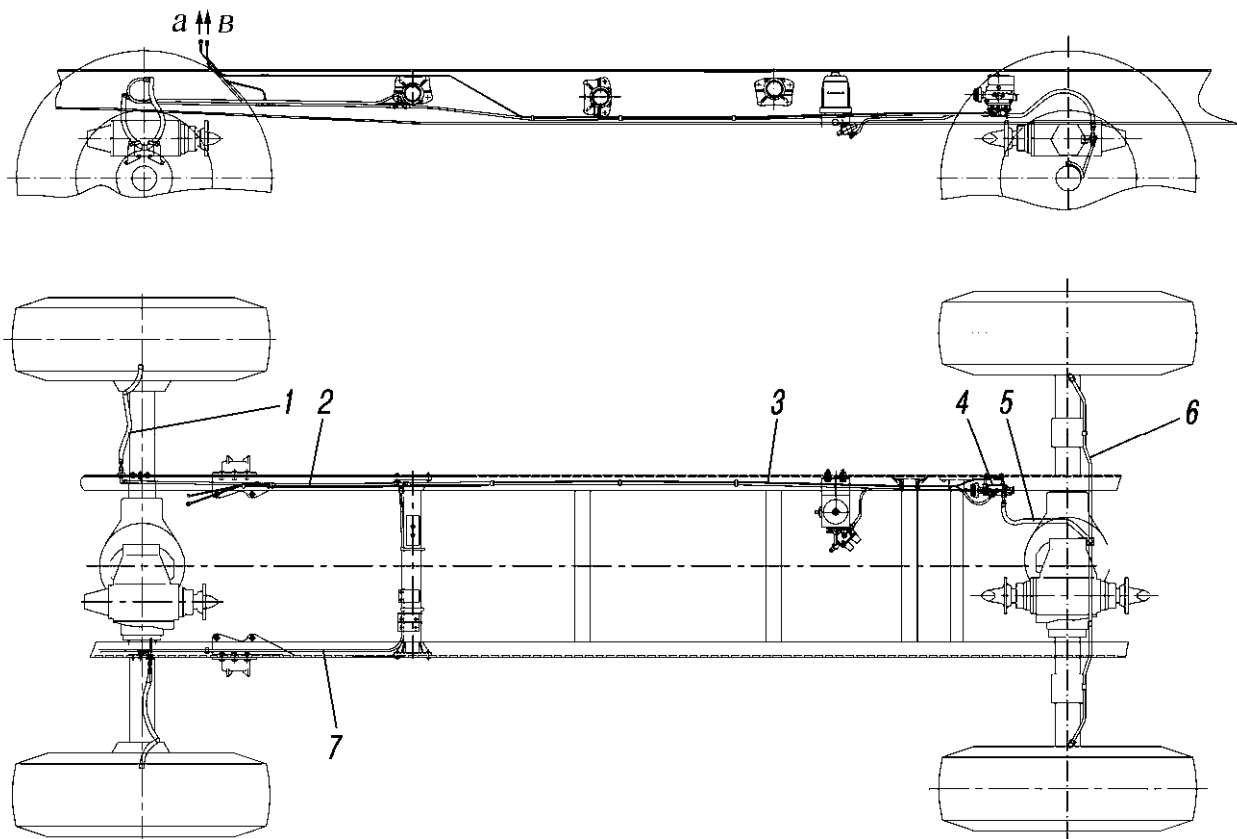
Air is supplied to the tires via a double-line circuit.

Prior to starting, open the wheel valves; set the pressure control valve levers to the neutral position and check the tire pressure. Bring the pressure to the norm if required and close the wheel valves. Pressure norms for tires 425/85R21 with load index 156 are shown in Table 12. **For monitoring the tire air pressure the wheel valves should be opened.**



1-hoses; 2,3,5,6,7-air lines; 4-solenoid valve; a - to the pressure gage of front wheels; B - to pressure gage of rear wheels

Figure 135 - Tire Air Pressure Control System with a Solenoid Valve Mounted on the Chassis Frame (6x6)



1-hoses; 2,3,5,6,7-air lines; 4-solenoid valve; a - to pressure gage of front wheels; в - to pressure gage of rear wheels

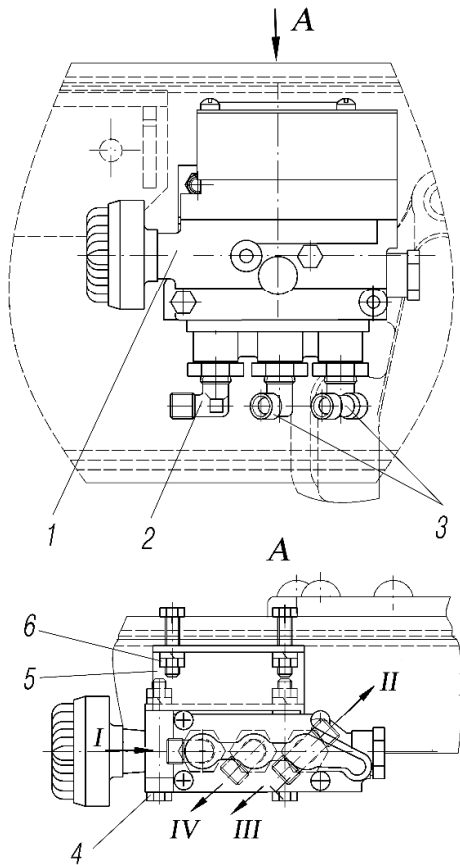
Figure 136 - Tire Air Pressure Control System with the Solenoid Valves Mounted on the Chassis Frame (4x4)

Table 12 – Pressure norms in tires 425/85R21 with load index 156

Road type	Permissible pressure, kgf/cm ² (MPa)	Max speed, km/h	Максимальный пробег в течение гарантийного срока, км
Difficult terrain swampy terrain, virgin snow and loose sand	minimum:		
	0,8 (0,08)	15	600
	1,1 (0,11)	25	800
	2,0 (0,20)	30	1400
Roads of all types for the period of tire inflating after difficult terrain section only	from 2,0 up to the rated pressure	40	1400

Solenoid valves have three working positions: DEFLATION (ВЫПУСК), NEUTRAL (НЕЙТРАЛЬ) and INFLATION (НАКАЧКА) and insure tire air pressure decrease within 4-6 minutes depending on the tire size in accordance with Industrial Standard OST 37.001.144-73.

Solenoid valve installed on the truck is shown in Fig. 137.



1-solenoid valve; 2-elbow; 3-fittings; 4-bolt; 5-bracket; 6-nut; I-from safety valve; II-to rear axle tires; III-to intermediate axle tires; IV- to front axle tires

Fig. 137-Solenoid valve

5.9.5 Sealing System

The sealing system is used for sealing truck units and systems which may be flooded with water when the truck crosses fords and for maintaining constant pressure in the inner spaces of the units as well as in fuel tanks.

6 Possible troubles and methods of trouble shooting

Trouble	Possible Reason	Trouble-shooting
Starting Preheater		
Preheater boiler is overheated	Formation of ice plugs in the feed branches due to the non-full water draining or incorrect preheater use. Water does not circulate	Warm pipes by switching the preheater on and off with 2-3 minutes intervals and by pouring the pipes with hot water
Preheater fails to start	Fan propeller is frozen due to incomplete water drain after washing or fording of truck	Warm fan case and fluid pump using materials at hand
	Fluid pump impeller is frozen due to non-full water drain out of cooling system	Warm fan case and fluid pump using materials at hand
	High-voltage source circuit is open	Check and tighten terminal connections of the wires
	High-voltage source is not functioning	Disconnect the high-voltage cable and secure its end 3-5 mm apart from truck ground. If there is no spark when plug is switched on, replace the high-voltage source
	Spark plug is not functioning	Clean or replace the spark plug
	Electromagnetic valve is not functioning (no click when the electromagnetic valve is switched on)	Check the circuit leading current to the valve, check wire terminals for tightness
	Fuel filter is clogged in electromagnetic valve or injector	Wash the filter and blow it through with compressed air or replace it
	Injector is clogged	Disassemble injector; wash its parts in kerosene or acetone. Reassemble the injector and check for spraying when injector is not screwed in burner
	Pump unit electric motor is not running	Check the circuit of the electric engine, tightening of wire terminals in the clamps
	Fuel pump is maladjusted	Adjust pressure reduction valve of the fuel pump

Trouble	Possible Reason	Trouble-shooting
Preheater smokes or throws out flame	Fuel pump is maladjusted	Reduce fuel consumption adjusting pressure reduction valve of the fuel pump
	Electric motor shaft speed insufficient	Charge storage battery, check motor
Engine is warmed continuously, pre-heater burns irregularly	Low fuel supply due to the filter or injector clogging, faulty sealing of fuel pipelines, fuel pump maladjustment	Wash filters, injector, repair fuel pipelines. Readjust reduction valve of the fuel pump
Transfer Gearbox		
Excessive noise	Insufficient quantity of oil in transfer gearbox	Add oil up to the level of the control plug
	Increased axial displacement of primary and intermediate shafts	Adjust the bearings or replace by the new ones
Gears shift spontaneously	Gear shift fork or coupling is worn out. The splines of the gear shift coupling and primary shaft are worn out	Replace worn parts
Engagement of gears and locking of differential are obscured	Burrs on gear splines, front holder, shift coupling	Grind surface of splines
	Lock sticks	Clean hole for ball
Driving Axles		
Excessive axle noise	Contact pattern for bevel gears is displaced towards tooth narrow end edge	Adjust meshing at contact pattern
	Clearance in reducing gear bearings	Restore preloads of the bearings
	Gear teeth working faces are worn or damaged	Replace gears
Wheels and Tires		
Intensive uneven wear of tread pattern	Incorrect toe-in of wheels	Adjust tow-in of wheels
	Wheel hub and steering knuckle king pin bearings are incorrectly adjusted	Adjust the bearings
	Steering connection parts are worn out	Replace the worn out parts

Trouble	Possible Reason	Trouble-shooting
Intensive uneven wear of the tread pattern	Considerable radial or lateral wheel wobbling Hard braking or start, driving with decreased or increased tire pressure, tire overload	Replace the wheels with excessive radial or lateral wheel wobbling Observe the rules and drive rationally. Stick to the norm of tire pressure, do not overload the tires
Steering		
Unstable truck movement, the free travel of the steering wheel is more than 25° Steering gear is hard to operate	Parts of steering rod joints, the splined bushings of steering cardan drive are worn out Steering gear fasteners are loose Insufficient oil level in the steering gear hydraulic system tank Air or water in the system (foam, cloudy oil) Insufficient tension of the pump drive belt The pump does not provide required delivery and pressure High oil leakage in the distributor, burrs on the supporting faces of the slide valve The splined joint of the steering cardan shaft lost its mobility The seat of the pump safety valve screwing-out Insufficient oil level in the tank of the hydraulic steering system	Replace worn parts, lubricate the splined joints Tighten up the steering gear case fastening bolts Top the oil up the required level Bleed the air. Otherwise check the tightening of all the joints, remove and wash the gauze filter, check the gasket under the collector. Check up collector fastening bolts for tightening; otherwise, change oil Tighten the belt Adjust tightening of the belt Check the pump Replace the distributor Disassemble, clean and lubricate Disassemble the pump, tighten the seat Add oil to required level
Steering gear is hard to operate		
Excessive noise when pump operates		

Trouble	Possible Reason	Trouble-shooting
Oil is thrown through oil tank breather	Filter clogging Gasket under collector is destroyed Too high oil level Oil filter is clogged	Wash the filter Replace the gasket Bring the oil level to the norm Check the unit and wash the filter
Brake System		
When the brake pedal is pressed the truck does not stop – the brake failure signal light turns on	Friction linings are worn out, the clearances between shoes and drums is too great	Replace friction linings. Adjust the clearances between shoes and drums of service brakes
Minimal air pressure signal light is constantly ON (with the running engine)	No brake fluid in master cylinders tanks No air due to the faulty compressor, pressure governor, pneumatic system faulty sealing	Replace the brake fluid, bleed the brakes if necessary Eliminate the compressor fault, replace the pressure governor. Find air leakage and eliminate it
Braking is not efficient enough – the brake failure light turns on	Brake fluid leakage, air in the master cylinder or in the hydraulic line of one of the brake circuits	Find the leakage and eliminate it. Add the brake fluid and bleed brakes
Braking is not efficient enough – minimal air pressure signal light turns on	Inner collar is worn out or fluid is not available in one of the master cylinders Piston collars or the air booster spacer collar are worn out, when the brake pedal is depressed air goes out of the outlet pipe of the pneumatic booster	Replace the collar. Add the fluid and bleed the brakes Replace collars
Brakes are blocked (are not released)	No free travel of the brake pedal Mineral oil gets in hydraulic drive, which causes the swelling of the rubber collars Compensation hole in master cylinder is clogged	Adjust the free travel of the brake pedal Wash the hydraulic drive with alcohol, replace collars Remove tank and clean compensation hole using soft wire of 0.6 mm in diameter
Pressure governor operates frequently	Compressed air leakage out of the line between governor and protective valve unit	Tighten joints, replace faulty connectors, pipelines

Trouble	Possible Reason	Trouble-shooting
Storage Batteries		
Battery cannot ensure required engine crankshaft rotation speed	The battery charge is below permissible limit Excessive voltage drop in starter supply circuit All or some battery cells are faulty	Charge battery and check generator and voltage regulator Clean up battery terminals and wire lugs, lubricate them with petroleum jelly. If required tighten the fastening of starter wire lugs Get the battery repaired
Rapid battery self-discharge	Contamination of battery outlets by dirt or electrolyte splashed over battery surface Contamination of electrolyte with foreign impurities	Wipe the battery with a dry cloth and then with the cloth wetted in 10 % liquid ammonia or soda ash solution Discharge battery with current equal to 1/10 of battery capacity down to 1.1-1.2 V per a battery cell. Drain out electrolyte, rinse battery, fill it with fresh solution and charge
Electrolyte level in battery drops too quickly	Electrolyte boils out	Check the voltage regulator
Electrolyte ejects out of vent hole of one or several battery cells during charging	Monoblock unit damaged Excessive level of electrolyte Excessive charging current Short circuit in one of battery cells	Get the battery repaired Use rubber syringe to remove excess electrolytic solution Check the voltage regulator Get the battery repaired
When charging completely discharged battery, voltage and temperature of electrolyte rise quickly with intensive gassing whereas density rises insignificantly	Sulphating of plates due to not using the battery for a long time or operating the battery with the low level of electrolyte over a long period of time or systematic undercharging	Sulphated plates are repaired by charge-discharge cycle with current not exceeding 1/20 of battery capacity at initial electrolyte density not exceeding 1.12 g/cm ³ . Highly sulphated plates should be rejected
Power Take-off		
Power take-off (PTO) cannot be engaged	The pneumatic chamber diaphragm of the power take-off engagement mechanism is damaged	Replace the diaphragm

Trouble	Possible Reason	Trouble-shooting
Power take-off (PTO) cannot be disengaged	PTO drive gear teeth are worn out or damaged Considerable air leakage due to insufficient tightening of the air lines fixtures or their fault Return spring of the PTO pneumatic chamber engagement mechanism is damaged Control valve rod seizing No clearance between the valve and the rod in the disengaged position due to the control valve deformation	Disassemble the box, prime gear teeth or replace the worn out parts Detect the leakage spots by applying soap solution on the hose and fixtures. Tighten up the fixtures in the leakage spots. Replace the faulty parts Replace the spring Disassemble the valve, eliminate the reason and apply a thin layer of ЦИАТИМ-201 grease on the rod housing Replace the control valve
Auxiliary Power Take-off		
Auxiliary power take-off (APTO) is difficult to engage	Burrs on the shaft splines of the auxiliary power take-off and those on the shift sleeve	Grind the spline surface
Excessive vibration, noise and oil leakage	Loosening of the flange nut	Replace the flange nut
	Auxiliary power take-off rear bearing wear	Replace the rear bearing
Auxiliary power take-off pump is not functioning	Oil supply pipe is damaged	Replace the pipe
	Pipe fastening nuts are not tightened	Tighten the nuts
	Oil grooves are clogged	Blow oil grooves through with compressed air
	Pump valves leakage, air suction	If necessary, disassemble auxiliary power take-off and wash the parts carefully
Winch		
Rope winding guide does not lay the rope on the drum correctly	Chain break Sliding block is damaged Actuating screw is damaged	Replace the chain Replace the sliding block Replace the screw

Trouble	Possible Reason	Trouble-shooting
Rope winding guide does not lay the rope on the drum correctly Drum jams	Insufficient tension when the rope is winded on the drum Guide rollers holder case was not in the extreme right position while rope fixing on the drum Rope unwinds from the drum due to incorrect operating: when the rope was paid out forced the sag was not set correctly Rope was winded on the drum without necessary tension	Unwind the rope, ensure a rope tension over 3000 N (300 kgf) when it is winded on the drum Set the guide rollers holder case correctly Unwind the rope, disconnect it from the drum, then fix it when the guide rollers holder case is in the extreme right position Unwind the rope, if necessary, remove the winch and replace the damaged parts Rewind the rope

7 Peculiar features of operation

7.1 Preparation of a New Truck for Operation

Before putting a new truck into operation, study this Operation Manual, carry out the daily maintenance, and additionally proceed as follows:

1. Check a coolant level and refill, if required.
2. After filling the fuel tank, prime the engine fuel system using the fuel feed hand-operated pump.
3. Check electrolyte level and density in the storage batteries; refill distilled water and re-charge the batteries, if required.
4. Open the wheel valves and bring the tire pressure up to rated value.
5. Check the door locks.
6. Check operation of window lifters in the cab doors.
7. Perform a test run.

7.2 Engine start and stop

7.2.1 Sequence of operation carried out for starting the engine depends on heat condition and also on an ambient temperature. Electric starting system allows for the engine start at temperatures down to minus 12°C without heating. If an ambient temperature drops from minus 12 to minus 25°C, use the glow-plug preheater for facilitating engine startup, at a temperature from minus 25°C and lower temperatures make use of a starting preheater.

If the storage batteries are undercharge and for the purpose of enhancing the service life of the engine, it is recommended by the Ural Automobile Works to use the starting preheater also at an ambient air temperature below 0 °C.

7.2.2 Engine start without warming

The procedure of starting the cold engine at temperature from 0 to minus 12 °C:

1. Pump through the engine fuel system using the manual fuel feed pump.
2. Set the gear shift lever in neutral position.
3. Shut the radiator blind.
4. Switch on storage batteries.
5. Set the engine stop lever in the working position (shift it up till it thrust at the board).
6. Depress the clutch pedal as far as it will go.
7. Depress the fuel feed control pedal up to the position corresponding to the medium rotation frequency of the crank shaft.
8. Holding the pedal depressed, switch on the starter by turning the key clockwise up to the stop.
9. After the engine starts, switch off the starter by releasing the switch key, hold the fuel feed pedal in the position corresponding to the medium rotation frequency of the crank shaft until the engine starts to operate in a steady mode, then smoothly release the clutch pedal (the gearshift lever should be in the neutral position). Set the minimum rotation frequency of the crank shaft by using the speed control lever. The constant rotation frequency of the crankshaft is set by pulling the lever 3 (see Fig. 15). The lever is connected with the control regulator of the fuel injection pump assembly by the tie rods and is located in the cab on the dash board. If the engine fails to

start, repeat the steps in the above stated order. If engine still fails in three attempts, find and eliminate the defect. The starter may be switched on for 15 sec only; the minimum interval between the engine start attempts should be not less than 1 min.

Before starting the heated engine set the fuel feed pedal in the position corresponding to the medium rotation frequency of the crank shaft. Switch on the starter and after the engine starts release the starter switch key.

7.2.3 Cold engine start with use of glow-plug preheater

The procedure of cold engine start at temperature from minus 12 °C to minus 25 °C:

1. Pump the engine feed fuel system through using a fuel-feed hand-operated pump (after parking the truck longer than twenty four hours).
2. Switch on the storage batteries.
3. Put the gear lever to the neutral position.
4. Switch on the instruments turning the ignition key in the middle position.
5. Put the engine stop lever to the working position (rest it against the board).
6. Depress the glow-plug preheater switch-on button and hold it until the signal light glows.
7. Press the fuel feed control pedal up to the position corresponding to the medium rotation frequency of the crankshaft.
8. After the signal light turns on, press the clutch pedal against the stop and switch on the starter turning the ignition key to the utmost right position and holding the button switched on.
9. When the engine starts running, switch off the starter, hold the glow-plug preheater switch-on button pressed until the engine runs steadily, then gradually release the clutch pedal and the glow-plug preheater button. If the engine has not started, repeat the procedure in the above-mentioned sequence with the pauses between the starts of 1-2 min.

7.2.4 Cold engine start with the help of the engine starting preheater

The procedure of starting the cold engine at temperature from minus 25 °C and lower.

If anti-freeze liquid is used in the engine cooling system, warm it up and start it in the following order:

1. Raise the hood. Make sure that the heater fuel tank valve is open.
2. Switch the pump unit on using the switch located on the start preheater control panel for 10-15 sec.
3. Switch the fuel electric heater on using the switch located on the starter preheater control panel (the switch is spring-loaded), and hold the switch handle in turned position for a period of 30 sec if the ambient temperature is above minus 30 °C and for 60 sec if the ambient temperature is from minus 30 down to 50 °C.
4. Switch the spark plug on using the switch located on the starter preheater control panel (the switch is spring-loaded), and at the same time switch on the pump unit and the electromagnetic valve without switching off the spark plug. Hold the spark plug switch handle (not longer than 20 sec) until you hear specific noise from the tank which indicates the process of fuel combustion in the burner. The properly functioning heater should start in 10-15 sec.
5. Release the spark plug switch handle (the spark plug is switched off). A continuous even noise in the tank indicates that the heater has started operating in a stable way. If the heater fails to

start, switch the pump unit and the electromagnetic valve off and repeat the start in a minute in the same order. If two subsequent efforts to start the heater failed, start troubleshooting procedures.

6. Close the hood.

7. When the liquid in the engine cooling system is heated up to 80-100 °C according to the readings of the anti-freeze temperature indicator on the dash board, switch off the electromagnetic valve, blow through the boiler gas ducts for 20-30 sec and switch off the pump unit.

8. Start the engine according to the procedure stated in the section «Engine start without warming».

7.3 Running-in a new truck

A service life, reliability, and economical operation of the truck depend on the initial running-in of the parts in the pre-service period. The running-in of the truck may be performed prior to putting a new truck in operation as well as in the course of operation. The new truck should be carefully serviced within this period; and the operation rules listed below are to be strictly observed.

When driving the truck, watch that units do not overheat. During an initial run of 1500-3000 km proceed as follows:

- warm the engine at the crankshaft speed of 1100-1300 min⁻¹;
- do not exceed the travelling speed of 5 km/h with the first gear engaged; 10 km/h with the second one engaged; 20 km/h with the third one engaged; 40 km/h with the fourth one engaged and 50 km/h with the fifth gear engaged;
- do not use the truck under heavy road conditions and with a trailer;
- retighten the wheel nuts twice: after 100-150 km and 200-300 km run as well as every time when removing from and mounting the wheels on the truck hub;
- do not reduce the tire pressure. Use the bolster-type trucks during the initial 1000 km run on hard-surface roads and articulated with a semi-trailer having the gross weight no more than 12 t.

After 1500 up to 3000 km (50 to 100 hours of engine running) run follow the procedure described in the section "Maintenance. Maintenance in Pre-Service Period".

7.4 Driving technique

Proper driving of the truck is one of the most important conditions of extending its service life and ensuring trouble free-operation, hence, the truck could be driven at high average travelling speeds with minimum fuel consumption.

The truck could cross over heavy road sections provided that all the mechanisms are applied skillfully. If the truck tows a trailer or if it is driven under heavy road conditions (snow, mud, soft ground, sand and the like), start in the first gear only. When crossing over soft ground, damp meadows, virgin snow, and sandy sections, drive the truck smoothly, without jumps, slipping, and stops. Drive through small snowdrifts and upgrades by accelerating the truck.

When crossing over extremely heavy road sections (snow, mud, soft ground, sand and the like), reduce the tire pressure down to the required level that corresponds to the best passability across this section, and lock the transfer gearbox differential because **skidding of the drive wheels when the truck becomes immovable or driving of the truck when the wheels skid with the differential unlocked leads to severe wear of the transfer gearbox differential and the tires.**

If differential lockup is engaged or disengaged with difficulty and gears shifting in transfer box is carried out with difficulty, start driving (forward and backwards) and repeat the process of switching.

When driving the truck on heavy roads with the possible skidding of the truck, lock the cross-axle differential of the rear axle (rear bogie). Cross-axle differential lock improves the truck cross-country capacity when the opposite driving wheels are on the surfaces with different friction coefficient causing the wheels to slip. The differentials shall be locked in advance of overcrossing the difficult section but not at the moment when the truck has lost its mobility.

Differential is locked after the truck is completely stopped. The locking of the cross-axle differential is admissible when the truck is driven at a speed 5 km/h max provided there is no skidding. After the lock valve is switched on, make sure that the locking mechanism is fully engaged. The signal light 2 (see Fig. 19) should flash on. Before crossing a difficult road section, make sure that the locking mechanism is fully engaged. Incomplete engagement of the locking mechanism may lead to damage of the reducing unit.

Having crossed over difficult road section, switch off the rear axle (rear bogie) differential lock valve and make sure the coupling unit is disengaged (the signal light should go out).

Lock the cross-axle differentials only in those cases when all other means to improve truck's cross-country capacity have been used (the required pressure in tires is set, transfer case differential is locked).

In all other cases if there is no skidding, unlock the transfer gearbox differential to avoid extra load in the transmission. Engage a low gear in the transfer gearbox when crossing over a difficult road conditions as well as on steep upgrade.

Shift gears in the transfer gearbox only when the truck has been completely stopped, do not set the transfer gearbox control lever in the neutral position if the gearbox gear is engaged and the auxiliary power take-off is disengaged on stand-still truck with running engine.

If differential lock of intermediate and rear axles is not engaged or disengaged, start driving (forward and backwards) till the indicator lamps light up or turn out.

Engage the auxiliary power take-off and the power take-off only if the truck is fully stopped, with the clutch being disengaged and the air pressure in the pneumatic system being not less than 500 kPa (5 kgf/cm²). After the Δ OM/KOM (APTO/PTO) button is pressed and the signal light Δ OM/KOM (APTO/PTO) on the dash board turns on, release the clutch pedal smoothly. If the signal light does not light up, crank the main shaft of the transfer gearbox by short partial engagement of the clutch. If the signal light still does not light up after this procedure, eliminate the defect and engage again.

Brake the truck smoothly, depress the pedal gradually. On long descents apply engine braking along with the auxiliary brake. The revolutions of the engine crank shaft can be close to the nominal value but not exceeding 2,100 min⁻¹. If the rotation speed exceeds 2,100 min⁻¹, periodically brake the vehicle vigorously applying the service brake.

Caution! Do not shut down the engine on long downgrades.

It is not recommended to stop the truck on a slope. In case of a forced stop take all measures to exclude the possibility of the truck rolling down: cut off the fuel feed, apply the parking brake, engage the first gear in the gear box and place thrust blocks behind the wheels.

To avoid sideways skidding, drive carefully on slippery and ice-covered roads.

If the truck is outfitted with a centralized tire pressure control system, when driving on improved roads with specified load, check that tire pressure is rated (according to the subsection «5.9.4. Tire pressure control system»).

Do not reduce the tire pressure by more than is necessary for the road conditions. Remember that driving with reduced tire pressure should be limited. Reduce the pressure only in the case of utmost need.

When driving the truck with reduced tire pressure, observe the tire pressure gauge readings.

It is prohibited to drive with reduced tire pressure to achieve a smoother ride. After a long period of driving, the pressure in the tires may rise due to heating. Do not reduce the pressure in heated tires in order to reduce the rolling resistance and for fuel economy.

7.4.1 Fording. The truck equipped can cross fords of up to 0.7 m deep. Before crossing, measure the depth of the ford, inspect the condition of the bottom, make sure there are no deep holes, large stones, boggy areas. Choose and check the place where the truck goes in and out of the water, mark deep places with stakes

To cross a ford, set the tire pressure to rated.

For fording, engage the first or the second gear in the gearbox and a low gear in the transfer gearbox; lock inter-axle differential. Drive in the water slowly, raising no waves and avoiding maneuvering, do not stop. The time of driving the truck in water should not exceed 15 min.

To avoid water and dirt penetrating the tool box, press the tool box cover tightly by the central screw. On crossing a ford, open the tool box, remove water and dry the tools.

On crossing a ford, check the oil level in the engine and other truck units. High oil level, water drops on oil level gauge or change in oil color indicates water penetration. If water is found in the engine oil crankcase, change the oil.

Check the presence of water in the engine fuel feed system, having unscrewed the drain plugs of the fuel tank and the coarse-mesh fuel filter prior to fuel outflow. If there is water, drain the sediment from the tank and replace the filtering elements of the fuel fine-mesh filter.

Remove water from the air line of the pump unit and the starting preheater boiler by switching on the pump unit for 2-3 min.

Make sure there is no water in the cavities of the engine flywheel housing and the clutch housing by removing the flywheel hatch cover and unscrewing the tapered plug from the bottom hatch of the clutch housing. After checking reassemble removed parts. The check should be done as quickly as possible after crossing water to avoid the vehicle being parked for a long period without these checks.

Pack fresh grease in sliding bearings and joints as soon as possible.

After crossing a ford, drive with caution as the efficiency of the brakes decreases due to the wet linings. Dry the brake mechanisms by braking the truck three-five times during driving.

If the engine stalls in fording, make two-three attempts to start the engine by the starter with intervals of 1 min. If the engine does not start, the truck must be towed out of water.

If the truck stuck in water for more than 20 min tow it to the nearest service station for maintenance. If the truck moves by its own, check all main assemblies as well as the cavities of

the wheel hubs and the front axle steering knuckles (for traces of water). If the oil level in the units is high, reduce it to the required level and change the oil as soon as possible.

On crossing a ford, prepare all the components for operation in normal road conditions and repair all water leak-proof connections of units. To keep the truck ready for fording, regularly check the condition of the hoses, pipes, their joints, assemblies' packing and repair in due time.

When driving on cross-country terrain, drive at low speed, in particularly difficult conditions lock the transfer gearbox differential for **crossing trenches, ditches and pits**. Cross trenches at a right angle, otherwise when the vehicle tilts, the load could be re-arranged and unloaded wheels could slip.

7.4.2 Driving with a trailer. To sustain the operability of the towing device, use the trailer hitching loop of 90 mm in inner diameter and of 42 mm cross-section, the towing hook with throat diameter of 48 mm and width in the throat zone of 69 mm. Maximum permissible dimensions: loop cross-section 38 mm, hook throat 52 mm, hook width 66 mm.

Replace the towing hooks and loops with dimensions differing from the above mentioned with the new ones.

While maneuvering, avoid folding of the trailer until the trailer tow-bar thrusts against the frame side-member end faces or other truck parts.

Otherwise, the trailer loop could be seized in the towing hook throat and the towing hook could be broken.

When driving on extremely difficult roads sections uncouple the trailer and after crossing them, pull it to the truck with the winch. Remember that three-four coils there should be left on the winch drum. Pull the trailer at the medium rotation frequency of the engine crankshaft. Do not tow the trailer using the winch rope.

Mind that three or four coils should be left on the winch drum. Pull the trailer at the engine crankshaft medium speed. Do not tow the trailer by the winch rope.

Caution! When driving with applied auxiliary brake on a slippery road with low friction coefficient and with no solenoid valve engaging the braking system of the trailers, skidding and folding of the trailer are possible

7.5 Vehicle towing

Towing can be performed with a flexible towing (using a towing cable) or rigid towing (using tows of «towing rod» or «towing triangle» type), made according to State Standard GOST 25907-89.

When towing and extracting the truck the available towing devices and pull ropes (chains) are used. Truck towing or using it as a prime mover should comply with the Road Regulations and Safety Instructions that are in effect in the organizations, where the truck is in service.

When the truck is towed with non-working engine, driver of the towed truck must engage neutral gear in the transfer gearbox. See the order of shifting to neutral gear in the section «5.2.2 Transfer gearbox» of the Manual.

7.5.1 Installation of the towing and auxiliary devices. The prime mover's and towed truck's coupling should be carried out in the following sequence:

- remove the towing cable or «triangle» towing device, depending on the characteristics of the faults and towing road conditions;
- if necessary, assemble the towing gear;
- hitch the towed truck with the prime mover by the crews;

- if necessary, supply air from the prime mover to the towed truck using a trailer tire inflation hose and the coupling head from the SPTA kit. Connect the hose to the towing valve located under the front bumper of the faulty truck by the nut with thread M16x1.5 and to the coupling head of the prime mover by means of the coupling head on the other end of the hose;

- if the alarm light signaling is faulty, fix a warning triangle on the tailgate of the towed truck.

7.5.2 Towing of the truck with non-running engine and steering booster is possible on all road type. Towing of the truck with the non-running engine and the steering booster without a driver is allowed only with the «triangle» rigid towbar. In this case the speed on sharp turns should not exceed 10 km/h.

7.5.3 Control checkup en route. After half an hour of towing and then every 1.5-2 hours check the towing attachments, warning triangle fixation (if any), check the state of the transmission housings and the wheel hubs by hand for overheating if they are faulty.

8 Maintenance

The maintenance is intended to keep the truck in the operable condition and proper appearance, in order to reduce the wear intensity of parts, to prevent failures and malfunction as well as to detect them in order to provide their timely elimination. The maintenance is a preventive compulsory measure which is conducted regularly according to the plan with the frequency determined by the truck runs or operation periods.

The periodic and qualitative maintenance in the stated volume ensures the constant technical serviceability of the truck and reduces the repair requirements. In order to fulfill the works properly, it is recommended to perform maintenance on special stations equipped with all the necessary tools and accessories.

The works connected with the adjustment and maintenance of the engine feed system units, electrical equipment, hydraulic systems should be carried out by qualified specialists.

8.1 Types of Maintenance

Depending on the maintenance schedule and labor input the maintenance is subdivided into the following types:

- Daily Maintenance (DM);
- Servicing after trip
- Maintenance in the initial period of operation after the run from 1500 up to 3000 km, (M-(1500-3000));
- Maintenance every 15 000 km (M-15 000).

8.2 Maintenance Schedule

Daily maintenance is performed before the truck departs to the line and after it returns.

Maintenance in the initial period of operation is performed after the first run from 1500 km up to 3000 km (50-100 hours of engine operation).

Maintenance of special purpose vehicles intended for technological operations (repair trucks, truck cranes, specialties for oil-and-gas industry etc.) shall be performed according to hour meter (30 km of truck run corresponds to one engine hour).

For trucks indented for transportation (tank trucks, tippers, personnel crew carriers, bolster trucks, sided truck buses etc.) the maintenance shall be performed according to truck run.

The truck running and the time of power unit operation between the maintenance operations are given for the first operational category in compliance with State Standard GOST 21624. The maintenance schedule is adjusted depending on the category of operational conditions of the truck in accordance with Table 13 and climatic areas of the truck operation in accordance with Table 14. In order to calculate the general adjustment coefficient, it is necessary to multiply the coefficients stated in Tables 13 and 14. In order to define maintenance schedule depending on operational conditions, it is necessary to multiply the schedule for the first category of operational conditions by the general adjustment coefficient.

Таблица 13 - Maintenance schedule adjustment coefficient depending on the category of operational conditions

Category of operational conditions	Operating conditions of the truck	Adjustment coefficient for the maintenance schedule
I	Automobile roads of technical categories I, II, III outside the suburban area on the flat, slightly undulating and undulating terrain with cement-concrete and asphalt-concrete pavement.	1.0
Category of operational conditions	Operating conditions of the truck	Adjustment coefficient for the maintenance schedule
II	1. Automobile roads of technical categories I, II, III outside the suburban area on the hilly terrain, as well as in small towns and suburban areas (all terrain types, except mountain type) with cement-concrete and asphalt-concrete pavement. 2. Automobile roads of technical categories I, II, III outside the suburban area (all terrain types, except mountain type), as well as in small towns and suburban areas on the flat terrain with bitumen-mineral pavement. 3. Automobile roads of technical category III, IV outside the suburban area with broken stone and gravel pavement on all terrain types, except mountainous and mountain terrain.	0.9
III	1. Automobile roads of technical categories I, II, III outside the suburban area, automobile roads in towns and suburban area (mountain terrain), as well as in cities, with cement-concrete and asphalt-concrete pavement. 2. Automobile roads of technical categories I, II, III outside the suburban area (mountain terrain), automobile roads in towns and suburban area (all terrain types, except flat type), as well as in cities (all terrain types, except mountain type), with bitumen-mineral pavement. 3. Automobile roads of technical category III, IV outside the suburban area in the mountainous and mountain terrain, automobile roads in suburban area and streets of towns, streets of cities, (all terrain types, except mountainous and mountain terrain), with broken stone and gravel pavement. 4. Automobile roads of technical category III, IV, V outside the suburban area, automobile roads in suburban area and streets of towns, streets of cities (flat terrain), with pavement out of pebble stone and sledged stone, also with pavement out of ground treated with binding materials. 5. In-Works automobile roads with advanced pavement. 6. Winter roads.	0,8
IV	1. City's streets with bitumen-mineral pavement (mountain terrain), with broken stone and gravel pavement (mountainous and mountain terrain), with pavement out of pebble stone and sledged stone, also with pavement out of ground treated with binding materials (all terrain types except flat terrain).	0.7

Table 13 Ending

Category of operational conditions	Operating conditions of the truck	Adjustment coefficient for the maintenance schedule
IV	2. Automobile roads of technical category V outside the suburban area, automobile roads in suburban area and streets of towns (flat terrain) with pavement out of ground with or without treatment with local materials 3. Wood tracks and forestry soil roads in good order	0.7
V	Natural soil roads, intra-organizational roads in rural area, in-pit and dump roads, temporary access ways to different types of construction objects and sand, clays, stone etc, mining sites when the traffic is possible there	0.6

Table 14 - Maintenance schedule adjustment coefficient depending on the climatic areas

Climatic area	Adjustment coefficient for maintenance schedule
Cold-temperate	1.0
Warm-temperate, warm-temperate humid, warm humid	1.0
Hot arid, very hot arid	0.9
Cold (with average temperature in January ranging from minus 15 to minus 35 °C)	0.9
Very cold (with average temperature in January ranging from minus 35 °C and below)	0.8

8.3 List of maintenance operations

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Daily maintenance (DM)				
Maintenance before leaving				
Inspect the truck and check absence of fuel, oil, brake fluid and coolant, as well as air leaks; eliminate troubles if any			+	+
Inspect the engine; clean it from dust and dirt, if required.			+	+
Check oil level in booster pump tank, add required	Oil level should be between upper and lower marks on oil level gauge	Oil level gauge, wiping material	+	+
Fill the windshield washer pump tank in	At sub-zero temperatures drain water from the tank	Vessel	+	+
Check good repair and serviceability of lighting devices, light and sound alarms, instrumentation and windshield wipers	Faults can not be tolerated		+	+
Check operation of the generator against current indicator	The current indicator should show the charging current	Current indicator	+	+
Check for good working order of: - clutch;	Clutch should provide complete and smooth engagement (without slipping), complete disengagement (without dragging)		+	+
-steering gear;	Steering rod and booster pin nuts should be cottered, play in the joints can not be tolerated, loose propeller shafts forks fasteners are impermissible	Visual check	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
- service brakes;	Check serviceability of pilot lamps by pressing test push-button: the pilot lamps should light up	Truck pressure gage, brakes failure indicator on dashboard	+	+
Check fluid level in expansion tanks of clutch hydraulic drive	Fluid level should be 15-20 mm lower than filler neck upper edge	Vessel, wiping material	+	+
Check the condition of cabin windows and rear view mirrors as well as door locks working order	Faults can not be tolerated		+	+
Check the absence of sediment and water in fuel coarse filter sediment bowl. If available If available – drain water and sediment			+	+
Inspect bolster unit and subframe fastening of bolster trucks	Fasteners of bolster unit and subframe should be tight		+	+
Check tires condition and wheels fastening, eliminate troubles if any	Tires should be without damages and foreign objects in tread. Loose wheels fastening nuts are impermissible	Visual check. Tighten torque wheels fastening nuts if necessary	+	+
When operating with a trailer check the absence of axial displacement of the towing hook, eliminate if any (see subsection «Frame»)	Axial displacement of the towing hook max 5 mm is admissible	Socket wrench 55, tire iron with hydraulic jack tommy-bar	+	+
Check and tighten towing units fastening to the cross-member if necessary	Loose fastening is impermissible	Wrenches 17x19, 22x24	+	+
<i>Servicing after trip</i>				
Maintenance of the engine is to be conducted in compliance with Engine Operation Manual				
If required wash the truck and clean the cab and the platform body preventing water ingress onto floor and engine compartment linings		Hand hose washing, brushes, wiping material	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
In winter to prevent moisture condensing in fuel tank fill it up to the full volume Drain condensate out off air reservoirs. In winter drain condensate every time you leave warm garage	When draining condensate, check that air reservoirs are under pressure	Filling station	+	+
Maintenance at the beginning of operation after the run of 1500 - 3000 km (50-100 hours of engine operation) (M-(1500-3000)) <i>Engine and its systems</i>				
Maintenance of the power unit and EDC is to be conducted in compliance with Operation Manual for power unit Check and if required tighten all the fastening points of the power unit, all the connections of the air intake and exhaust system	Loosening is not admissible	Wrenches 14x17, 17x19	+	+
<i>Transmission</i>				
Check and if necessary adjust the free travel and full travel of the diaphragm single-disk clutch pedal (see the section «Clutch release drive») Check the tightening of and, if necessary, tighten the nuts fastening: - propeller shafts; - level, upper and lower caps of steering knuckles and ball joints flanges	For 4x4 and 6x6 trucks: Clutch pedal free stroke should be within the range from 5 up to 10mm, Full travel should be from 185 up to 190 mm. Loosening is not allowed Ditto	Wrenches 17x19, 14x17, pliers, ruler Wrench 17x19, box wrench 22x24 Box wrench 24x27	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check the tightening of and, if necessary, tighten the nuts and bolts fastening driving axles final drives	Loosening is not allowed	Wrench 22x24, box wrench 22x24, pliers, screwdriver	+	+
Running gear				
Check the tightening of and if necessary tighten the nuts fastening:				
-torque rod pins;	Loosening is not allowed. If slots for cotter pin do not match, tighten the nuts	Socket head for 50, tire iron with tommy-bar, pliers, screwdriver, driftpin, hammer		+
- front spring pin fixing wedges;	Loosening is not allowed.	Ключ 17x19	+	+
- front spring eyes;	Ditto	Socket wrench 30x32, tire iron with tommy-bar	+	+
- rear spring eyes (for 4x4 trucks);	-«-	Ditto	+	
- front spring eye U-bolts;	-«-	Box wrench 22x24	+	+
- rear spring eye U-bolts (for 4x4 trucks);	-«-	Ditto	+	
- wheels	-«-	Socket wrench 27x38 for wheel nuts, tire iron	+	+
- front spring U-bolts;	Loosening is not allowed. Perform the tightening on a fully loaded truck	Socket wrench 30x32 for spring U-bolts nuts, tire iron with tommy-bar	+	+
- rear spring U-bolts;	No loosening is permissible. Perform the tightening on a fully loaded truck (for 4x4 trucks), for 6x6 trucks tightening is done on unloaded truck	Socket wrench 27x38 for wheel nuts, tire iron with tommy-bar	+	+
Check and if necessary tighten up the bolts fastening:				

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
- front brackets of the front springs and (for 4x4 trucks) the rear springs rear brackets to the lower flange of the frame side-member;	No loosening is permissible.	Wrenches 17x19, 22x24	+	+
- front springs rear brackets to side-member stiffener;	Ditto	Wrench 22x24 (24x27), socket wrench 24, tommy-bar	+	+
- front bracket caps of the rear spring;	-«-	Box wrench 22x24	+	
- walking beam shaft assembly to the rear suspension walking beams brackets;	-«-	Socket wrench 30x32, tire iron		+
- rear suspension walking beam brackets to the cross member;	-«-	Wrench 17x19		+
- upper torque rod brackets to the rear suspension axle beams	-«-	Socket wrench 24, pinchbar for cranking, box wrench 22x24		+
- towing unit (if operating with the trailer)	-«-	Wrenches 17x19, 22x24	+	+
Steering				
Check tightening of and, if required, retighten nuts fastening:				
- steering link pins;	Loosening is not allowed.	Wrench 24x27, box wrench 24x27, pliers	+	+
- steering booster;	Ditto	Box wrench 24x27, Socket wrench 36, pliers, screwdriver, hammer, Tire iron with tommy-bar	+	+
- steering gear housing fastening bolts;	-«-	Wrenches 17x19, 22x24, box wrench 24x27	+	+
- steering shaft cardan forks	-«-	Wrenches 14x17, 17x19	+	+
Replace the drain filter of steering hydraulic system tank and check oil level in booster pump tank, add if need be	Leaking of oil through the tank cap sealing is not allowed. Oil level should be between upper and lower marks on the indicator with plug unscrewed	Wrench for bleeding air from hydraulic brakes, screwdriver, oil vessel, vessel for washing of units, wiping material	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Brake system				
Check air drive tightness, in doing so pay attention to the friction surfaces or harmful contacts of pipelines and eliminate the troubles	Air system should have no air leaks		+	+
Check outlet pressure out of both brake valve sections and operability of four-circuit safety valve (see subsection «Air Drive of Service Brake System»)	Air pressure on the test-pressure gages should be equal to the pressure in the system (see readings of two-pointer pressure gage) when the brake pedal is fully depressed	Test-pressure gages	+	+
Check the brake pedal free travel and adjust, if required (see subsection «Air Drive of Service Brakes»)	Brake pedal free travel should be equal to 20-30 mm.	Wrenches 17x19, 22x24, screwdriver, pliers	+	+
Electric Equipment				
Check density and level of electrolytic solution in the storage batteries, add distilled water, if required	See the service manual for the storage batteries	Wrenches 11x13, 17x19, vessel with distilled water, glass pipe 3-5 mm in diameter	+	+
Check fastening, cleanness of and contact security of cable terminals to starter terminals and of storage battery	Cable terminals fastening should be safe	Wrenches 14x17, 17x19	+	+
Check and adjust headlamps, if required (see subsection «Lighting and Signaling System»)	Adjust headlamps on the unloaded truck placed on an even horizontal ground	Screwdriver, screen with special marks	+	+
Make sure the electricity cable bundles are securely fastened	Fastening should be tight	Pliers, screwdriver, knife, insulating tape	+	+
Check the fastening of the storage battery box brackets to the frame	Ditto	Wrenches 17x19, 22x24	+	+
Clean battery surface from the dust and dirt; clean vent openings in the storage battery vent plugs	Battery surface as well as vent plug openings should be clean	Wiping material, wire Ø 2 mm	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check and retighten the fastening of engine starting preheater high-voltage source, if required	Fastening should be tight	Screwdriver	+	+
Check condition of rubber jackets on rear lights, side turn repeaters, storage battery switch, braking signal, fuel level sensor, auxiliary brake switch	Ditto	Visual inspection	+	+
Special equipment				
Check the power take-off case fastening to the gearbox case and oil pump fastening to the power take-off case (if available)	Fastening should be tight	Wrench 14x17	+	+
Lubrication				
Engine lubrication should be carried out as per Engine Operation Manual			+	+
Check oil level in the steering knuckle housings of front driving axle and bring to the norm, if required			+	+
Change oil: - in the transfer gearbox case (see the subsections «Transmission» and «Chart of lubricants and operating fluids»)	Pour oil in up to the inspection/fill opening on the rear wall of the case. Oil leakage through the plugs is not admissible	Wrench 27x30, vessel for used oil, oil dispenser 133M, wiping material	+	+
Change lubricant in driving axles final drives	Pour oil in up to the inspection/fill opening on the rear wall of the case. Oil leakage through the plugs is not admissible	Wrench 27x30, vessel for used oil, oil dispenser 133M	+	+
Lubricate in accordance with the Chart of Lubricants and Working Fluids:				

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
- pins of front (for 4x4, 6x6 trucks) and rear spring (for 4x4 trucks);	Pump the lubricant in till fresh lubricant appears out of pin and spring eye conjunction	Lever-plunger gun or solid oil injector, wiping material	+	+
- rear walking beam suspension hubs	Pump the lubricant in till fresh lubricant appears from under sealing ring	Lever-plunger gun, wiping material		+
- towing unit bushings (when operating with trailer)	Pump the lubricant in till fresh lubricant appears	Ditto	+	+
Lubricate clutch drive intermediate bracket shaft and brake valve actuator	Lubricate with the oil filler until the fresh lubricant appears	-«-	+	+
Lubricate steering rod joints and steering booster joints (see «Chart of Lubricants and Working Fluids»)	Pump the lubricant in before deformation of protective coupling of the end. Joints should be tight.	Lever-plunger gun, wiping material	+	+
Check oil level in winch reducer case and add, if need be (see subsection «Chart of Lubricants and Working Fluids»)	Oil level should be up to the edge of inspection opening. Oil leakage through the plugs is not admissible	Wrench 24x27, oil dispenser 133M, wiping material	+	+

Integrated Maintenance after 15 000 km of run (500 hours of the engine operation)

Engine

Maintenance of the power unit and EDC is to be conducted in compliance with Operation Manual for power unit			+	+
Check and if required tighten all the fastening points of the power unit, all the connections of the air intake and exhaust system	Loosening is not admissible	Wrenches 14x17, 17x19	+	+
Check fastening of starting preheater and fuel tank	Fastening should be tight Coolant and fuel leakage Operation of starting preheater with an open flame at the outlet is forbidden	Wrenches 11x13, 14x17	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check fuel coarse filter fastening	Fastening should be tight	Wrench 14x17	+	+
Check radiator unit fastening	Ditto	Wrench 17x19, pliers	+	+
Check air filter fastening	-«-	Screwdriver, wrench 10x12	+	+
Check tightening and re-tighten the cooling system clamps and engine starting preheater clamps, if required	Coolant leakage is not allowed	Wrench 7x9, screw-driver	+	+
Check and retighten the fuel pipeline nuts, if required	Fuel leakage is not allowed	Wrench 24x27	+	+
Drain sediment from fuel tank	Fuel leakage through drain plug is not allowed	Wrench 17x19, vessel, wiping material	+	+
Change coolant in cooling system (every three years)	Coolant level should be near «MAX» mark on the expansion tank surface	Vessel with coolant, wiping material	+	+
Filtering element of the dry-type air filter should be maintained upon the readings of the clogging indicator but at least at every maintenance works. When operating in conditions with high dust content it should be serviced more often on the basis of operation experience in such conditions	At the new filtering element installation check visually its condition having illuminating it from inside with the lamp. To avoid carton tearing the compressed air pressure should be 200-300 kPa (2-3 kgf/cm ²) maximum. Air stream should be directed to the surface angularly, stream force should be adjusted by changing the distance to element	Wrench 14x17, screw-driver, vessel	+	+
Transmission				
Check and adjust the single-disk diaphragm clutch pedal free and full travel (see subsection «Clutch release drive»), if required	For 4x4 and 6x6 trucks: Clutch pedal free travel should be within 5 – 10 mm. Full travel should be within 185 - 190 mm.	Wrenches 17x19, 14x17, pliers, ruler	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check and adjust tapered bearings of primary and intermediate shafts of transfer case (see subsection «Transfer case»), if required	Every second M-15 000: primary and intermediate shafts axial throw is 0,03-0,08 mm	Wrenches 8x10, 10x12, 11x13, 14x17, 17x19, 22x24, socket wrenches 27x38 and 41x46, combination pliers, screwdriver, tire iron, beam crane, pointer indicator, device for indicator fastening, driftpin, flange puller group 375-3918050, wiping material	+	+
Adjust the bearings of steering knuckles pivot (see subsection «Driving axles »)	Every sixth M-15 000: thickness of gaskets removed from under the lever and covers should be the same – 0,15 mm (0,05+0,1) mm	Box wrench 24x27, thrust supports under the lower covers of steering knuckles, jack, tire iron	+	+
Adjust driving axles final drives	Every sixth M -15 000. Technical requirements and adjustment order see in subsection «Driving axles»	Wrenches 110x12, 11x13, 17x19, 22x24, 24x27, device for reduction gears mounting dismantling, dynamometer, indicator, pliers, screwdriver, hammer, tire iron, axle shaft puller, wiping material	+	+
Check the tightening of and, if required, retighten nuts fastening (every second M-15 000):				
- propeller shaft;	Loosening is not admissible	Box wrench 24x27	+	+
- steering knuckles lower and upper covers lever and ball joints flanges	Ditto	Ditto	+	+
Check tightening of and retighten bolts and nuts fastening driving axles final drives if required	Fastening should be tight	Wrench 22x24, box wrench 22x24, pliers, screwdriver	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel ar- rangement	
			4x4	6x6
Running gear				
Check and if required re-tighten the nuts of:				
- front spring pins locking wedges;	Loosening is not admis- sible	Wrench 17x19	+	+
- front springs eyes;	Ditto	Socket wrench 30x32, Tire iron with tommy-bar	+	+
- rear springs eyes (for 4x4 trucks)	-«-	Ditto	+	
- front springs eye U-bolts	-«-	Box wrench 22x24	+	+
- rear springs eye U-bolts (for 4x4 trucks)	-«-	Ditto	+	
- front springs U-bolts;	Loosening is not al- lowed. Perform the tight- ening on a fully loaded truck	Socket wrench 30x32 for spring U-bolt nuts, Tire iron with tommy-bar	+	+
- rear springs U-bolts;	No loosening is per- missible. Perform the tightening on a fully load- ed truck (for 4x4 trucks), for 6x6 trucks tightening is done on unloaded truck	Socket wrench 27x38 for wheel nuts, Tire iron with tommy-bar	+	+
- torque rod pins	Loosening is not al- lowed. If slots for cotter pin do not match, tighten the nuts	Socket head for 50, tire iron with tommy-bar, pli- ers, screwdriver, driftpin, hammer		+
Check and if necessary tighten up the bolts fastening:				
- front brackets of the front springs and (for 4x4 trucks) the rear springs rear brackets to the lower flange of the frame side-member;	Fastening should be tight	Wrenches 17x19, 22x24	+	+
- front springs rear brack- ets to side-member stiffener;	Ditto	Wrench 22x24 (24x27), Socket wrench24, tommy- bar	+	+
- rear spring front bracket caps;	-«-	Box wrench 22x24	+	
- walking beam shafts as- sembly to rear suspension walking beam brackets;	-«-	Socket wrench 30x32, tire iron		+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
- rear suspension walking beam brackets to the cross member;	-«-	Wrench 17x19		+
- upper torque rod brackets to the rear suspension axle beams	-«-	Socket wrench 24, pinchbar for cranking, box wrench 22x24,		+
Check condition of tires, wheels and their fastening	See subsection «Wheels and tires». Loose fastening is not allowed.	Wrenches 11x13, 17x19, Socket wrench 27x38 for wheel nuts, jack, Tire iron with tommy-bar, platform ГАПО for wheels dismantling	+	+
Steering				
Check tightening of and, if required, retighten nuts fastening:				
- steering gear housing fastening bolts;	Fastening should be tight	Wrenches 19x22, 22x24 box wrench 24x27	+	+
- steering shaft cardan forks;	Ditto	Wrenches 14x17, 17x19	+	+
- steering link pins;	-«-	Box wrench 24x27, pliers	+	+
- steering booster	-«-	Box wrench 24x27, Socket wrench 36, pliers, screwdriver, hammer, Tire iron with tommy-bar	+	+
Check and adjust if necessary:	See section «Steering» (Steering wheel free travel check)	Playmeter		
- steering wheel free travel;			+	+
- front wheels toe-in	See section «Steering» (Front wheels toe-in adjustment)	Wrench 17x19, gas pipe wrench, measuring bar L=2000 mm	+	+
Replace drain filter of tank if steering hydraulic system and check oil level in the booster pump tank, add if required (replace at every third M-15 000, at steering booster repair)	Oil leaks through the tank cap sealing are not allowed. Oil level should be between upper and lower marks on the indicator with plug unscrewed	Wrench for bleeding air from hydraulic brakes, screwdriver, oil vessel, vessel for washing of units, wiping material	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Braking systems				
Check outlet pressure out of both brake valve sections and operability of four-circuit safety valve (see subsection «Air Drive of Service Brake System»)	Air pressure on the test-pressure gages should be equal to the pressure in the system (see readings of two-pointer pressure gage) when the brake pedal is fully depressed	Test-pressure gages	+	+
Check operation of pressure governor and trailer brakes control valve	Air pressure on pressure gages should be equal to the pressure in the system (according to two-pointer gage readings)	Wrench 11x13, pressure gages		
Check the brake pedal free travel and adjust, if required (see subsection «Air Drive of Service Brakes»)	Brake pedal free travel should be equal to 20-30 mm (for 4x4 and 6x6 trucks).	Wrenches 17x19, 22x24, screwdriver, pliers	+	+
Inspect spring brakes, clean them from dirt, check brake chambers for tightness and operability, tighten fastening nuts	Loosening is not allowed.	Wrench for round nuts 65-70	+	+
Check air drive tightness, in doing so pay attention to the friction surfaces or harmful contacts of pipelines and eliminate the troubles	Air system should be leak-free		+	+
Electrical equipment				
Check the fastening of the storage battery box brackets to the frame	Fastening should be tight	Wrenches 17x19, 22x24	+	+
Check storage batteries charging degree, density and level of electrolytic solution. Carry out checks in accordance with instructions of Storage Battery Operation Manual (at least once in three months)	Charge storage batteries completely in the battery-charging station, with a battery in 50 % discharge in summer and in 25 % discharge in winter	Wrenches 11x13, 14x17, 17x19, densitometer, distilled water tank, glass tube Ø 3-5 mm, wiping material	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check and adjust headlamps, if required (see subsection «Lighting and Signaling System»)	Adjust headlamps on the unloaded truck placed on an even horizontal ground	Screwdriver, screen with special marks	+	+
Check variable voltage	See subsection «Electrical equipment. Generator»	Voltmeter of accuracy class 1.0 with a scale of 0-30 V, screwdriver	+	+
Check condition of electricity cables insulation and their fastening	Ditto	Pliers, screwdriver, knife, insulating tape	+	+
<i>Cab, hood and fenders assembly and platform body</i>				
Check and tighten fastening of cabin, platform body and hood and fenders assembly, if need be	Fastening should be tight	Wrenches 10x12, 11x13, 17x19, 22x24	+	+
Check the condition of rubber cushions	Cracks and breaks are not allowed		+	+
<i>Special equipment</i>				
Check the power take-off case fastening to the gearbox case and oil pump fastening to the power take-off case (if available)	Fastening should be tight	Wrench 14x17	+	+
Check Auxiliary PTO pump operability (let auxiliary PTO work for 10 minutes and check its pump operation (if available))			+	+
Disconnect and blow the brake chambers pressurization system piping with compressed air	Piping clogging is not allowed	Wrench, 14x17, combination wrench 14x14, Socket wrench 10, air hose from compressor	+	+
When operating with the trailer, check the condition of thread on the hook and nut of towing unit. If hook and nut have damaged thread, replace them by the new ones	Thread deformation/damage is not allowed	Wrench 22x24, box wrench 24x27, Socket wrench 55, Wrench for bleeding air from hydraulic brakes, tire iron	+	+
<i>Lubrication</i>				
Engine lubrication should be carried out as per Engine Operation Manual				

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check oil level and bring it to norm if required: - in the transfer gearbox case; - in driving axles final drive; - in the steering knuckle housings of front driving axle Change lubricant (at every third M-15 000): - in the steering knuckle housings of front driving axle; - in final drives of driving axles (see subsection «Chart of lubricants and working fluids») - in the transfer gearbox case (see subsections «Transmission» and «Chart of lubricants and working fluids») Lubricate in accordance with Chart of lubricants and working fluids: - pins of front (for 4x4, 6x6 trucks) and rear springs (for 4x4 trucks); - hubs of rear walking beam suspension Lubricate in accordance with Chart of lubricants and working fluids: - upper bearings of pivots;	Oil level should be up to the inspection/fill opening edge. Oil leakage through the plugs is not admissible	Wrenches 17x19, 22x24, oil dispenser 133M, wiping material	+	+
			+	+
			+	+
	Pour oil in up to the inspection/fill opening on the rear wall of the case. Oil leakage through the plugs is not admissible	Wrench 27x30, vessel for used oil, oil dispenser 133M	+	+
			+	+
	Oil level should be up to the inspection/fill opening edge. Oil leakage through the plugs is not admissible.	Wrenches 17x19, 22x24, oil dispenser 133M, wiping material	+	+
	Pump the lubricant in till fresh lubricant appears out of pin and spring eye conjunction	Lever-plunger gun or solid oil injector, wiping material	+	+
	Pump the lubricant in till fresh lubricant appears from under sealing ring	Lever-plunger gun, wiping material		+
	Fill the lubricant in with the oil fillers in the amount stated in Chart of lubricants and working fluids	Lever-plunger gun, wiping material	+	+

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
- towing unit bushings (when operating with trailer); Lubricate in accordance with Chart of lubricants and working fluids the splined joints of: - drives of intermediate (for 6x6 truck), rear (for 4x4 truck) axle and intermediate shaft; - drives of front and rear axles (at every second M - 15 000) - steering; - winch drive (at every third (M-15 000) Lubricate supporting bearing of cardan drive (on long-base trucks) Remove wheel hubs, remove old grease and apply new one. Wash, lubricate and adjust hub bearings, when mounting (see subsection «Driving Axles» and Chart of Lubricants and Working Fluids) (every second M-15 000) Lubricate steering rod joints and steering booster joints (see Chart of Lubricants and Working Fluids) Lubricate shaft of intermediate bracket of clutch drive and brake valve actuator (at every third M-15 000) Disassemble the air cylinder of the auxiliary brake, lubricate the cylinder piston and inner cylinder surface	Pump the lubricant in till fresh lubricant appears Lubricate via oil fillers until fresh lubricant appears Change lubricant Disassemble and lubricate Lubricate via oil fillers until fresh lubricant appears Lubricate via oil filler Apply grease onto the rollers and bearings cage evenly on the whole outer surface. After a short run the hub should be cold or slightly warm when the bearings are adjusted correctly. Pump the lubricant in before deformation of protective coupling of the end. Joints should be tight. Lubricate via oil filler until fresh lubricant appears Apply a thin layer of the lubricant to the whole surface of the cylinders and pistons evenly	Lever-plunger gun, wiping material Wiping material Ditto - « - Wrench 17x19, box wrench 22x24, wiping material Lever-plunger gun, wiping material Socket wrench 140, Wrenches 10x12, 17x19, tire iron with tommy-bar, screwdriver, jack, platform ГАПО for hubs dismantling, reservoir for grease, wiping material, puller bolt (2 pcs.) Lever-plunger gun, wiping material Ditto Wrench 17x19, combination wrench 14x14, screwdriver, driftpin, pliers	+ + + + + - + + + + + +	+ + + + + + + + + + +

Description	Technical requirements	Recommended equipment, accessories and tools	Wheel arrangement	
			4x4	6x6
Check brake fuel level in clutch release hydraulic drive	Brake fluid level should be up to the inspection opening edge.		+	+
Lubricate in accordance with Chart of lubricants and working fluids (at every third M-15 000):				
- sliding bearing of winch drum shaft;	Lubricate till fresh grease appears	Lever-plunger gun, wiping material	+	+
- guide rollers shaft;	Apply grease	Ditto	+	+
- roller bushings and guide roller holder housing cavities of winch rope winding guide;	Apply grease	- « -	+	+
- chain gear of the winch rope winding guide	Lubricate the chain along the whole length	- « -	+	+
- working surfaces of winch rope winding guide lead screw and shaft guides;	Apply grease	- « -	+	+
- ball cup	Ditto	- « -	+	+

8.4 Truck lubrication

8.4.1 General

The lubricants and operating fluids chart provides the instructions for using fuels and lubricants of domestic manufacture and their foreign substitutes when operating the truck under conditions of temperate climate. Detailed recommendations and the lubrication procedure for particular units and parts are stated in the corresponding sections of the operating manual supplied with each truck.

The lubrication is performed as a part of the maintenance procedure (M) with the specified frequency and also when the unit is repaired.

When changing seasonal motor oil to all-season oil and vice versa, replace the filtering elements of the oil filter and wash the oil centrifugal purification filter.

Range of basic fuels and oils and their substitutes for the power unit as well as their seasonality and change frequency should meet the requirements stated in the operating manual for YaMZ engines supplied with each truck.

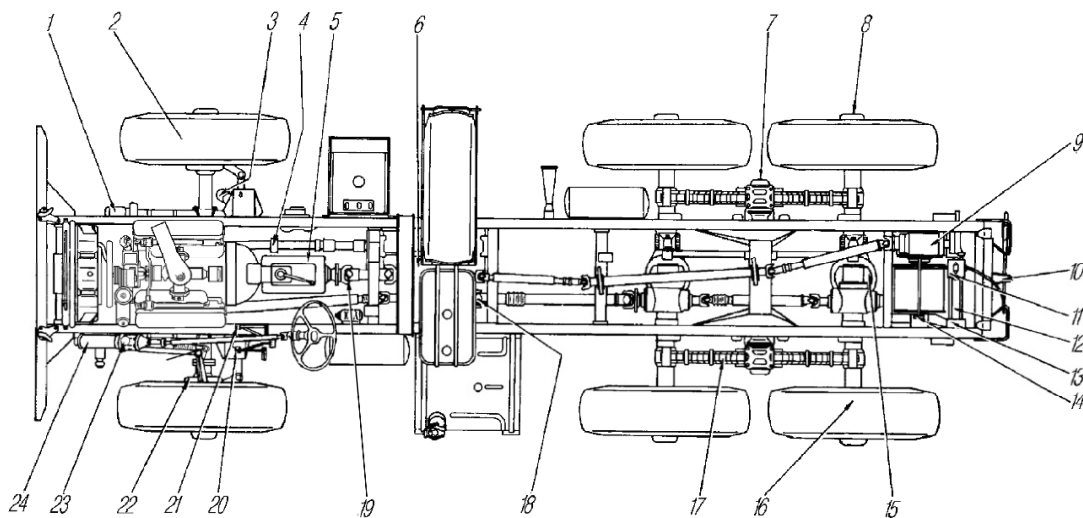


Fig. 138 - 6x6 truck lubrication diagram

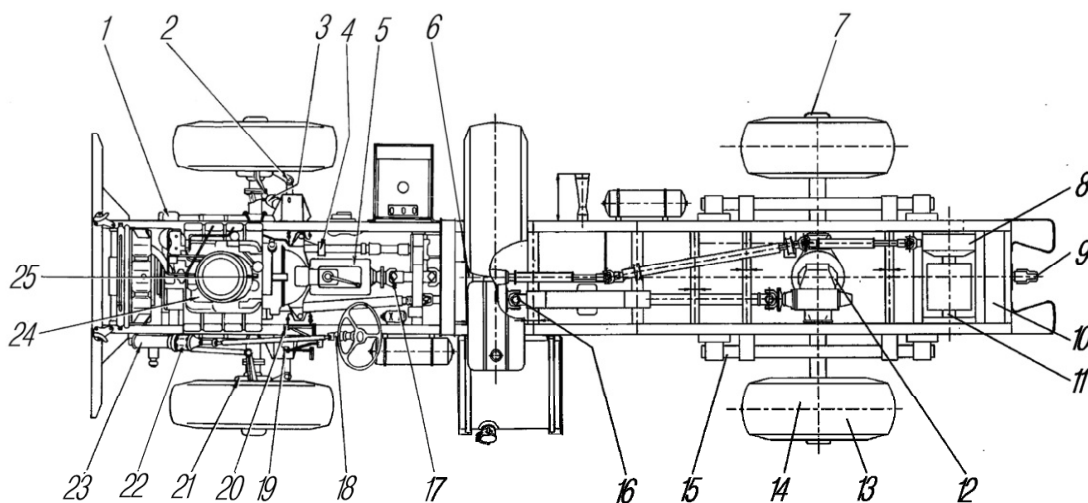
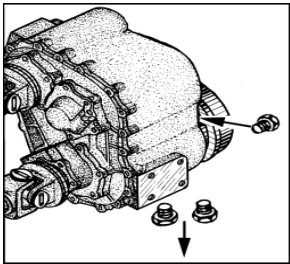
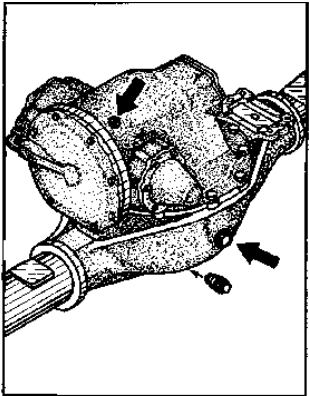
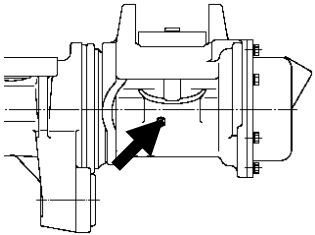


Рисунок 139 - 4x4 truck lubrication diagram

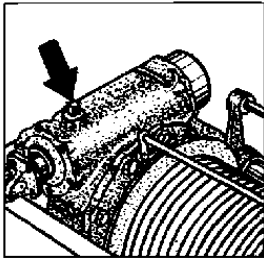
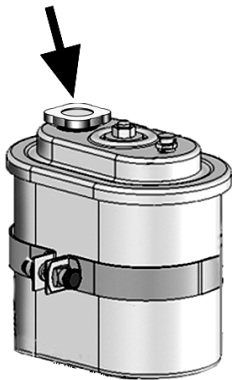
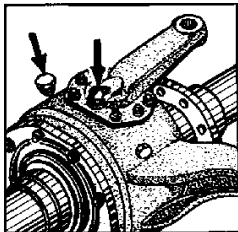
8.4.2 Chart of lubricants and working fluids

Pos. on Fig. 138, 139	Name of lubrication or filling point	The num- ber of points	The main grades, season application	Substitute grades, season application
1	2	3	4	5
-	Engine feed system	1	See the Operations Manual for YaMZ engines	
-	Engine crank case: YaMZ-65654	1		
-	Engine units	-	See the Operations Manual for YaMZ engines	
5	Gearbox ^{*2}	1	See the Operations Manual for YaMZ engines	
6	Transfer case ^{*2} 	1	Oil TCπ-15K (at temperatures not below minus 30 °C) Oil TCπ-10 (at tem- peratures not below mi- nus 45 °C)	At a temperature below minus 30 °C it is allowed to dissolve oil TCπ-15K by 10-15% of arctic or winter diesel oil or “Omskoil K TM3-18” Technical Speci- fications 38.301-19-93-97

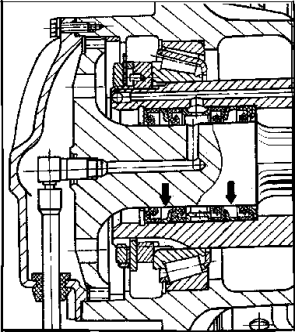
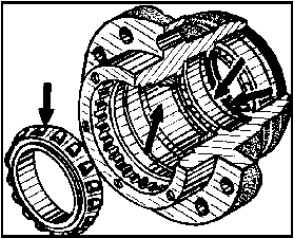
Foreign grades	Fuels and lubricants amount		Frequency of lubrication or change (fuels and lubricants replenishment)		Recommendations on lubrication (filling, oil or lubricant change)
	Filling norm (l, kg) ^{*1}	Total amount for a truck (l, kg) ^{*1}	Main brand	Substitute brand	
6	7	8	9	10	11
			See the Operations Manual for YaMZ engines		
	24	24			
			See the Operations Manual for YaMZ engines		
	5,5	5,5	See the Operations Manual for YaMZ engines		
Shell Dentax G 80W-90, Mobilube GX 90, Energear EP 80W-90	3,50	3,50	Maintenance (M) -(1500-3000)		Change oil. Add up to the lower edge of the filler neck.
			M-15 000		Check the oil level and add, if necessary up to the lower edge of the filler neck
			Every third M-15 000, but at least once in three years		Change oil.

1	2	3	4	5
-	Auxiliary power take off	1	Oil ТСП-15К (at temperatures not below minus 30 °C) Oil ТСП-10 (at temperatures not below minus 45 °C)	At a temperature below minus 30 °C it is allowed to dissolve oil ТСП-15К by 10-15% of arctic or winter diesel oil or "Оmskoil К ТМЗ-18" Technical Specifications 38.301-19-93-97
-	Cardan drive support bearing	1	Lubricant 158	Lubricant Литол -24
	Final drives of driving axles *2: - front		Oil ТСП-15К (at temperatures not below minus 30 °C) Oil ТСП-10 (at temperatures not below minus 45 °C)	Oil ТАп-15В (at temperatures not below minus 25 °C) At a temperature below minus 25 °C it is allowed to dissolve oils ТСП-15К and ТАп-15В by 10-15% of arctic or winter diesel oil or "Оmskoil К ТМЗ-18" Technical Specifications 38.301-19-93-97
-	- intermediate, rear 	2 (6x6) 1 (4x4)		
7	Rear walking beam suspension hubs 	2	Lubricant -24	Lubricant Литол-24РК

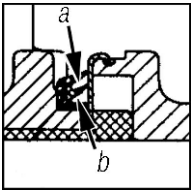
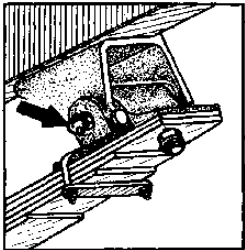
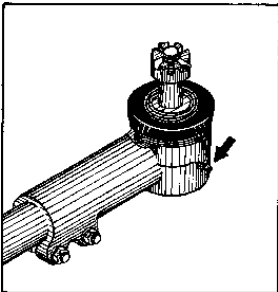
6	7	8	9	10	11
Shell Dentax G 80W-90, Mobilube GX 90, Energear EP 80W-90	0,01	0,01	-		At repair
	0,085	0,085	M-15 000		Lubricate using an oil- er till fresh grease ap- pears in the opposite oil- er hole.
	6,0-6,5 6,0-6,5	6,0-6,5 12,0-13,0 (6x6) 6,5 (4x4)	M-(1500-3000)		Change oil. Add, if necessary up to the level of the filler neck on the axle case. If the final drive is dismounted, firstly pour 1 l of oil through the hole for the breather on the fi- nal drive case, the re- maining oil should de poured through the filler neck up to its edge.
			M-15 000		Check the oil level and add oil if necessary
			Every third M-15 000, but at least once in three years		Change oil
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energear L2	0,15	0,3	M-(1500-3000) M-15 000		To gun-grease through oilers until fresh grease oozes from under sealing ring

1	2	3	4	5
9, 8*	Winch reduction gear 	1	Oil used for engine	Oil ТСгип
23, 22*	Steering hydraulic system: - MAZ – 64229	1	Oil ВМГЗ	Hydraulic oil «Р» Technical Specification 38.1011282-89 (at temperatures not below minus 30 °C)
	- steering oil tank 	1		
22, 21*	Front driving axle steering knuckle case 	2	Mixture of 35% of lubricant Литол-24 with 65% of oil for reduction gears of drive axles	Mixture of 35% of lubricant Литра with 65% of oil for reduction gears of drive axles

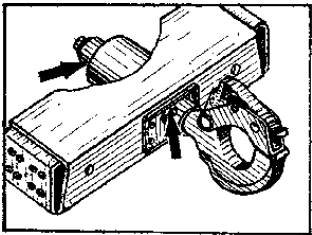
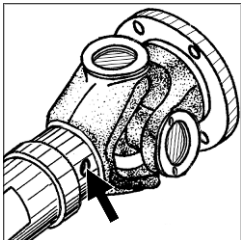
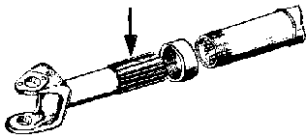
6	7	8	9	10	11
Mobilube GX 140, Shell pirax GX 140	7,5	7,5	M-(1500-3000)		Check oil level and add, if need be
			Every third M-15 000		Change oil. Add oil up to the edge of the fill- er neck on the reduction gear case cover.
STATOIL TRANSWAY PS DX III	6,5	6,5	Daily Maintenance (DM)		Check oil level in the steering booster pump tank and add, if need be
			M-(1500-3000) Every third M-15 000 When repairing steering hy- draulic booster		Change oil (together with filter changing) and check oil level in the steering booster pump tank
--	2,7	5,4	M-(1500-3000) M-15 000		Check oil level in the unit and add, if need be. Fill up to the control fill- er edge
			Every third M-15 000, but at least once in three years		Change lubricant

1	2	3	4	5
19, 17*	Spiders (needle bearings) of the prop shafts of: - drive of front, rear and intermediate shaft	8 (6x6) 6 (4x4)	Lubricant Литол-24	Lubricant 158
	- steering system	2		
	- winch drive	4		
2	Tire air supply collars *3 	6	Lubricant Лита	Lubricant ЦИАТИМ-201
8, 7*	Wheel hubs 	6 (6x6) 4 (4x4)	Lubricant Литол-24	Lubricant Лита

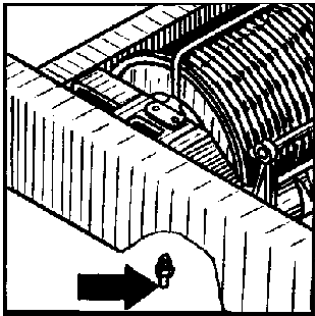
6	7	8	9	10	11
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrelase L2	0,004 0,004	0,32 0,024	M-15 000		Lubricate through oil filler until fresh lubricant appears
	0,006	0,012	-		Change oil during dis-assembly
	0,024	0,096			
AeroShell Grease 6	0,05	0, 30	-		Lubricate the working surface of the collars at repair, put the grease into the hollows between first and second and third and fourth collars Apply a thin layer of the lubricant on the axle-shaft working surface
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrelase L2	1,0 (6x6) 1,0 (4x4)	6,0 (6x6) 4,0 (4x4)	Every second M-15 000		Change lubricant. Apply lubricant on the collar working surface and into the space between bearing and collar, having removed the old lubricant first. Wash the outer bearing. Apply lubricant on bearing until the space between rollers is filled up with lubricant completely, apply lubricant into the hub between bearings

1	2	3	4	5
7	Hollow under guard ring of the walking beam hub 	2	Lubricant Литол-24	Lubricant Лита
-	Terminals and plugs of «ground» switch	4	Lubricant Литол-24	Solid oil Ж & Solid oil C
1, 15*	Front spring pins (for 4x4, 6x6 trucks) and rear spring pins (for 4x4 trucks) 	2	Lubricant Литол-24	Solid oil Ж & Solid oil C
-	Steering rods and booster joints 	6		

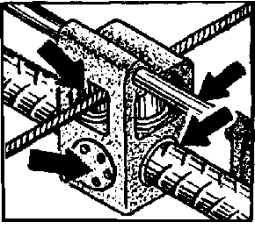
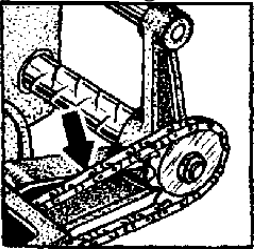
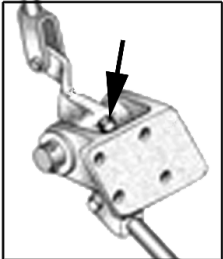
6	7	8	9	10	11
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrease L2	0,025	0,05	-		Fill up the hollows «a» and «b» under sealing ring lips when reassembling after repair with lubricant (having removed the old lubricant first)
	0,0005	0,002	-		At repair. Apply a thin layer of the lubricant
	0,025 (for 6x6, 4x4 trucks front springs) 0,04 (for 4x4 trucks rear springs)	0,05 (for 6x6, 4x4 trucks front springs) 0,08 (for 4x4 trucks rear springs)	M-(1500-3000) M-15 000		Pack grease till fresh grease from under the mating of spring pin and spring eye appears
	0,037	0,22	M-(1500-3000) M-15 000		Lubricate with the oil filler. Pump lubricant before deformation of protective coupling of the end

1	2	3	4	5
10, 9*	Towing device bushings 	2	Lubricant Литол-24	Solid oil Ж & Solid oil C
-	Knuckle pivot upper bearings	2		
18, 16*	Splined joints of: - intermediate axle drive (for 6x6 truck), rear axle drive (for 4x4 truck) and intermediate shaft drive 	2		
18, 16*	- front and rear axles drive 	2		
	- steering control	1		

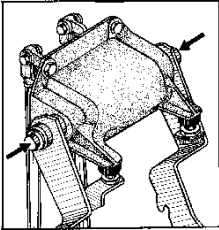
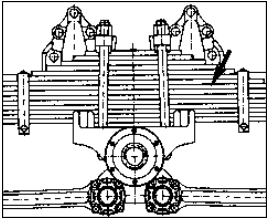
6	7	8	9	10	11
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrease L2	0,025	0,05	M-(1500-3000) M-15000		Lubricate using oilers till fresh grease appears (when operating with trailer).
	0,100	0,100	M-15 000		Lubricate using oiler
	0,020	0,04	M-15 000		Lubricate using oilers till fresh grease appears
	0,180	0,36	Every second M-15 000		Change lubricant
	0,025	0,010	M-15 000		Disassemble and lubricate

1	2	3	4	5
	- winch drive	2	Lubricant Литол-24	Solid oil Ж & Solid oil C
-	Spare wheel lift reducing gear	1		
14, 11*	Sliding bearing of the winch drum shaft 	1		
13	Winch rope winding guide bearings 	2		
-	Working surface of the bolster unit	1		
-	Bolster unit hook	1		

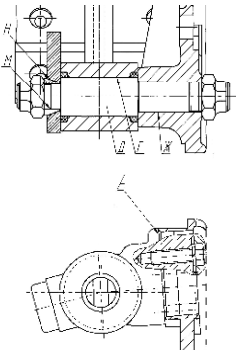
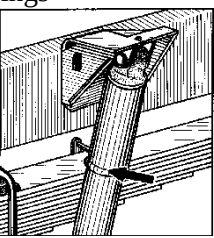
6	7	8	9	10	11
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrease L2	0,015	0,03	Every third M-15 000		Lubricate using oilers till fresh grease appears
	0,04	0,04	-		Lubricate while disassembling
	0,025	0,025	Every third M-15 000		Lubricate using oilers till fresh grease appears
	0,035	0,07	-		Lubricate while disassembling
	0,28	0,28	M-15 000		Lubricate the bolster unit working surface and hook using press-oilers
	0,015	0,015			

1	2	3	4	5
12, 10*	Working surfaces of winch rope winding guide actuating screw and shaft guides 	1	Graphite lubricant УСсА	Solid oil Ж, Solid oil С or Lubricant Литол-24
11	Roller bushings and guide rollers holder body cavities of the rope wind- ing guide	3		
-	Pin	1		
13	Winch rope winding guide chain gear 	1		
-	Intermediate bracket shaft of the clutch drive and the brake valve 	1		

6	7	8	9	10	11
Rhodina EP2, Alvania HDX2, Mobilgrease Graphited №3	0,15	0,15	-		Lubricate after each operation of winch
			Every third M-15 000		Apply lubricant (if the winch is not operated)
	0,033	0,1	Every third M-15 000		Apply lubricant
	0,004	0,004	Every third M-15 000		Apply lubricant
	0,05	0,05	Every third M-15 000		Lubricate the chain along the whole length
	0,03	0,03	M-(1500-3000) Every third M-15 000		Lubricate using an oiler till fresh lubricant appears.

1	2	3	4	5
21, 20*	Brake and clutch pedal shaft 	1	Graphite lubricant УСсА	Solid oil Ж, Solid oil С or Lubricant Литол-24
17, 15*	Spring leaves of front and rear suspensions 	4	Graphite lubricant УСсА	Solid oil Ж, Solid oil С or Lubricant Литол-24
-	Front and rear spring U-bolts thread	16		Oil ТСгип
-	Terminals of: - service brake system failure sensor	2	Lubricant ВНИИ НП-510 (at the Works only)	Lubricant Литол-24
-	- storage batteries	4		

6	7	8	9	10	11
Rhodina EP2, Alvania HDX2, Mobilgrease Graphited №3	0,015	0,015	-		Lubricate the bushings and pins while disassembly
	0,325	1,300	-		Lubricate the concave surface of the spring leaf after disassembly, having first removed the rust
	0,0025	0,02	-		Lubricate the threaded part during disassembly having cleaned from corrosion first
Shell Gadus S2 V220 2, RENOLIT EP2, Shell Gadus S2 V100 3, Mobilgrease XHP 222, Energrease L2		0,008	-		At repair. Apply a thin layer of the lubricant after connecting the terminals having cleaned them first

1	2	3	4	5
-	Service brakes support and wedge mechanism	12	Lubricant AMC-3	Rubber- or silicon-based sealers
-	Expansion cam, brake shoe pin and brake support	36		
-	Service brake shoes surfaces and pins 	12	Graphite lubricant УСсА	Solid oil Ж, Solid oil С or Lubricant Литол-24
3	Telescopic shock-absorbers - for 4x4 trucks front and rear springs; - for 6x6 trucks front springs 	4 2	Shock-absorber fluid Lukoil - АЖ	Shock-absorber fluid ГРЖ-12
-	Clutch disengagement hydraulic drive	1	Brake fluid ПОСДОТ	Brake fluids Томъ, Нева
			At a temperature below minus 30 °C dilute with ethyl alcohol in the amount of 18-20% by weight	

6	7	8	9	10	11
	0,0075	0,09	-		At disassembly. Prior to reassembly apply graphite lubricant on pins Д and brake shoe surface Г. Apply lubricant AMC-3 on surfaces H, M, Ж, A
	0,0022	0,08	-		
Rhodina EP2, Alvania HDX2, Mobilgrease Graphited №3	0,005	0,06	-		
Shell Tellus T15	0,850	1,700 (for 6x6 trucks) 3,4 (for 4x4 trucks)	-		Change fluid upon disassembly and repair having washed the shock-absorber parts in kerosene and dried them.
Shell Donax B, Brake Fluid DOT3/DOT4	0,5	0,5	DM		Check fluid level and add, if need be
			Once in five years	Once in three years	Change the fluid
			Once a year		Change diluted brake fluid for the new (not diluted) one for warm season

1	2	3	4	5
-	Cooling system with preheater	1	See the Operations Manual for YaMZ engines	

* For 4x4 trucks.

*¹ In columns 7, 8 oils and working fluids are given in liters, grease lubricants are in kilograms.

*² Oil and working fluid servicing norm in column 7 is nominal. It means that after priming procedure the oil (fluid) level is to be checked and, if necessary, brought to norm according to section «Maintenance»

*³ For Ural-43206-61, Ural-4320-60/61 trucks.

*⁴ For Ural-5557-61 trucks.

6	7	8	9	10	11
	29,0 ^{*3} 27,0 ^{*4}	29,0 ^{*3} 27,0 ^{*4}	See the Operations Manual for YaMZ engines		Check coolant level and add, if necessary, up to the norm: 15-25 mm above the cooling tubes ends in the radiator upper tank at a temperature up to plus 20 °C

9 Storage

9.1 General Provisions

A new truck, if it is not to be put into operation, can be stored without preservation, within three months from the date of its shipment from the manufacturing works. In this case, upon the truck has been put into storage, apply a thin layer of “Литол-24” grease or solid oil onto unpainted surfaces of the front axle ball supports, provide maintenance of the storage batteries and tires as per instructions given in the corresponding Operation Manual.

If it is required to store the truck within the period, exceeding the indicated above, it should be preserved and protected in conformity with the requirements of this section.

Store the truck in a clean, dry, ventilated and dim-out room or under a shed. When storing it on the open site, protect its tires, steering wheel, rubber and plastic parts from the sun rays, and cover the engine and its systems by water-proof packing paper or painted film, canvas, etc. Keep the tires inflated.

9.2 Storage Preparation

Perform the daily maintenance and scheduled maintenance depending on a truck run.

Fill in the housings of the transfer box, axle reduction units, steering with working-and-corrosion-preventing oils or working oils up to the norm; fill in the winch housing with the working oil.

Make sure that the winch lever is in its disengaged position, then engage the auxiliary power take-off drive for 3-5 minutes with the engine running.

Perform the preservation of engine and gearbox in accordance with the «Engine Operation Manual» and «Gearbox Operation Manual».

Protective and preservative materials are indicated in Table 15.

Seal in the intake pipe and the outlet pipe, crankcase ventilation fitting.

Close the wheel valves.

Drain water out of the washer reservoir.

Switch off the storage batteries.

Clean, wash, dry and powder with talc the cab floor rubber carpets, roll them up and put onto the seats.

When storing the truck on the open site, remove the truck platform canopy, wiper blades, rear-view, wide-angle and side-view mirrors, pack and store them in a closed room.

Dry the canopy prior to packing.

Cover the rubber parts by the protection compound as per Table 15 or wrap them up with a packing material.

Close the cab ventilation hatch tight, close the drop-sided window glasses, door vents and lift up the winter front.

Apply (as per Table) a thin layer of grease onto:

- plug and socket connectors of the rear lights, number plate light, reversing lamps and connections of the bottle air pressure sensors;

- terminal connections of the brake system failure sensors and the stop signal switches;
- storage battery output pole terminals with the wire lugs.

Table 15 - Preservative and Protective Materials

Designation of Material	Denomination and Composition
For preservation of transmission units	Working-and-corrosion-preventing oil TM5-12пк (Specifications 38 101 844-88) or transmission oil mixture ТСп-15К, State Standard (GOST) 23652-79 with 10% of additive AKOP-1 (by volume)
For preservation of exterior unpainted and painted surfaces and threaded areas	Gun grease as per State Standard (GOST) 19537-83
For preservation of plug-and-socket connectors and terminal connections of the electric equipment	Processing petrolatum BT13-1 (Specifications 38 101 180-76), grease “Литол-24” or solid oil
For touch-up painting of damaged metal surfaces	Enamels МЛ-12, orange, sand, khaki, as per State Standard (GOST) 9754-76; enamels МЛ-152, orange, sand, golden yellow, as per State Standard (GOST) 18099-78; enamel МЧ-145, orange, as per State Standard (GOST) 23760-79; enamel МЧ-123, black (Specifications 6-10-979-84); enamel MC-17, black (Specifications 6-10-1012-78)
To protect tires, hoses, drive belts and other rubber items from adverse effect of sunlight	Mixture of aluminum powder with light oil varnish or of aluminum paste with white spirit in the ratio of 1:4 or 1:5 (by weight). Fine casein composition-mixture of chalk (75 %), casein glue (20 %), slaked lime (4.5%), soda ash (0.25 %), phenol (0.25 %), by weight
Packing material for sealing and partial packing	Paraffined paper as per State Standard (GOST) 9569-79, capacitor paper as per State Standard (GOST) 1908-82, double-layer paraffined packing paper as per State Standard (GOST) 8828-75, packing bituminized and tar paper as per State Standard 10354-82, rubberized fabric, etc.

Lubricate the exterior unpainted surfaces of the front axle ball supports, open surfaces of the transfer box rods and those of the auxiliary power take-off with a thin layer of grease “Литол-24”.

Apply rust-preventing grease onto the open areas of threaded joints, cab door exterior handles, door vent casements, washer jet heads, head lamp ferrules, chain drive, lead screw, guide shafts, winch rope packer rollers and rope, "hook-nut" threaded pair of the tow-bar, and lubricate the open rod surfaces with the grease “Литол-24” or solid oil.

Lubricate tire irons attached to the truck, interior surfaces of the socket heads, tommy bar holes, dipstick and pullers with the rust-preventing grease; pack the indicated items with the paraffined or other paper.

Lubricate articulated joints of the auxiliary brake, those of the tool box, storage battery container, truck platform sides, cab doors, bonnet, door and bonnet locks with the working-and-rust-preventing (engine or transmission) oil.

Apply scotch tape for holes which connect the inner hollows with the atmosphere and are located on the brake valve, the pressure regulator, the trailer brake control valves, the condensate drain cocks, the sealing pipes behind the cab.

Unload the wheels, by lifting them up to 80-100 mm above the ground, and the truck suspension, following the procedure described below:

- to unload the front axle wheels (for 4x4 & 6x6 trucks), put the 620 mm high off-loading supports under the flanges of knuckle ball support 22 of the steering knuckles, as shown in Fig.44;
- to unload the rear axle wheels(for 6x6 trucks), put the 570 mm high off-loading supports under the supporting bracket of spring 6 according to Fig. 50;
- to unload the rear axle wheels(for 4x4 trucks), put the 670 mm high off-loading supports under the axle beams next to the supporting bracket of spring 23 according to Fig. 51;
- to unload the rear suspension(for 6x6 trucks), put the 1070 mm high off-loading supports under the frame side-members in the rear axle area;
- to unload the rear suspension(for 4x4 trucks), put the 1100 mm high off-loading supports under the frame side-members in the rear axle area;
- to unload the front suspension, put the 220 mm high off-loading supports between the springs and the frame side-members.

9.3 In-Storage Maintenance of Trucks

Check the tire pressure, condition of the protective coatings and devices; check the truck for fuel, oil and special fluid leaks every month. Eliminate the detected faults.

Regularly remove detected corrosion products from the painted and unpainted surfaces; restore damaged paint-and-varnish coatings; upon removing the corrosion from the unpainted surfaces, coat them with corrosion-preventing grease. Scrape the damaged paint-and-varnish coatings with the fine-grained or water-proof abrasive paper; after that wipe the surface with a piece of cloth moistened in clear gasoline or solvent, dry and coat it by two layers of enamel of the same colour with intervals of 5-10 minutes in summer, lubricate it with the corrosion-preventing grease in winter.

Engine and gearbox maintenance should be carried out in accordance with the «Engine Operation Manual» and «Gearbox Operation Manual».

On completing of work reseal the fuel feed system and gas exhaust system, let the air out from the reservoirs through the condensation drain cocks. Relubricate the ball support surfaces.

When storing the trucks in unheated rooms or under a shed, perform the above-said checking of the unit's, component's and system's serviceability every quarter.

When storing the truck on the open site or under a shed, and when truck units filled with the working-and-corrosion-preventing oils, check the serviceability of its service brake drives and clutch, control drives of gearbox, transfer box and parking brake once every six months by means of setting the corresponding levers in different positions. In case of the drive rods seizure (jamming), establish the reason and eliminate it.

After completion of checking, set all the levers in their neutral position.

9.4 Taking Trucks out of Storage

Before commissioning of the truck after its storage:

- check the tire pressure and bring it to the norm;
- remove the truck from its supports and release its springs;
- unseal the feed, exhaust and engine ventilation systems and the oil tank;
- remove the protecting grease from the truck exterior surfaces with the help of a piece of soft cloth moistened in kerosene or clear gasoline;
- remove the engine and gearbox from storage in accordance with the «Engine Operation Manual» and «Gearbox Operation Manual»;
- check oil level in the truck transmission components, steering booster pump tank, rear suspension balance beam hubs, oil tank and bring it to the norm, if required;
- perform inspection and maintenance of the truck as per requirements to its daily maintenance;
- if some of the working-and-corrosion-preventing or working oils and fluids, which are filled in the truck units and systems, do not agree with the season of their operation, or their expiration date has been reached, refill them with new ones;
- prior to starting the engine, pump oil through the feed system with the help of fuel supply pump;
- remove lower cover of the clutch housing hatch, remove the plug and put the hatch cover into its place.

10 Transportation

10.1 The trucks can be transported by rail, sea and air or under its own power. The mode of transport is specified in the supply contract. In so doing the preparatory works should be done as follows:

1. Prior to shipment check the tire pressure and, if required, bring it to the norm and close the wheel valves. The tire pressure in the trucks without the tire pressure control system should be of the rated value.

2. Upon placing the truck on a transport:

- brake the truck with its parking brake;
- throw into the first gear in the gearbox and the low gear in the transfer box;
- switch off the storage batteries.

3. The truck handling should be performed by its own power.

10.2 When transporting the trucks by rail, the truck mounted on the flat car should be fixed by two guy ropes on the rear tow-bar and by two guy ropes on the front towing hooks; thrust bars of 100x160x760 mm should be placed ahead of the front wheels and behind the rear wheels.

A truck placed above the coupling of the flat cars (see Fig. 140) should be secured by two guy ropes on the rear tow-bar and by two guy ropes on the intermediate axle springs support brackets. Thrust bars should be fixed ahead of the intermediate axle wheels and behind the rear axle wheels. The front wheels of the truck also should be fixed by thrust bars on the outside the wheels.

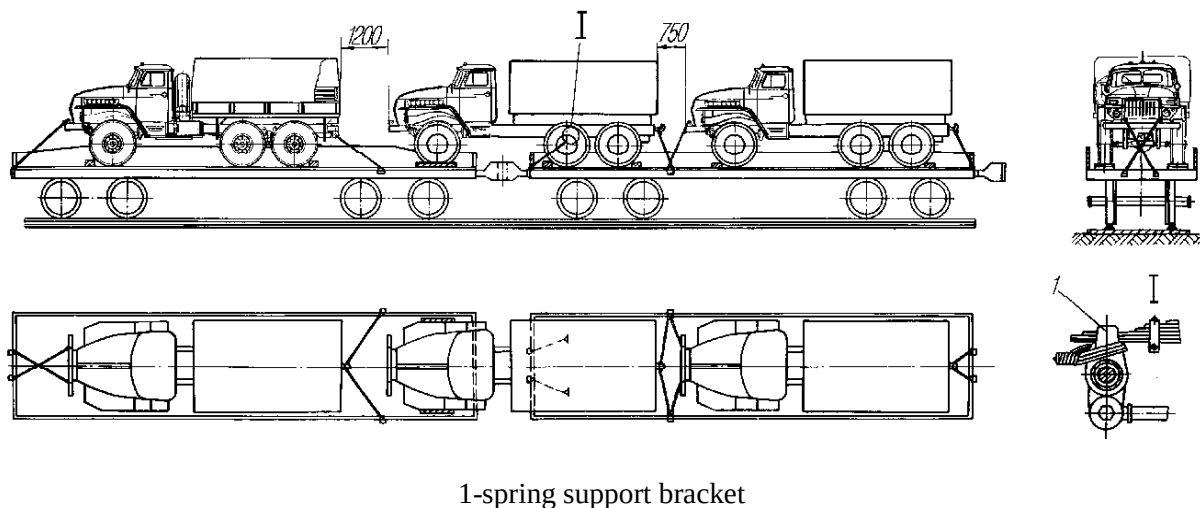


Fig. 140 – Loading and securing of three trucks on two four-axle flat-cars (for 6x6 trucks)

A truck placed on the flat-car according to the Fig. 141 should be secured by two guy ropes on the rear tow-bar and by two guy ropes the front towing hooks; thrust bars of 100x160x500 mm should be fixed ahead of the front wheels and behind the rear axle wheels. The front wheels of the truck also should be fixed by thrust bars on the outside the wheels

In every case coordinate the carrying conditions with a station of departure.

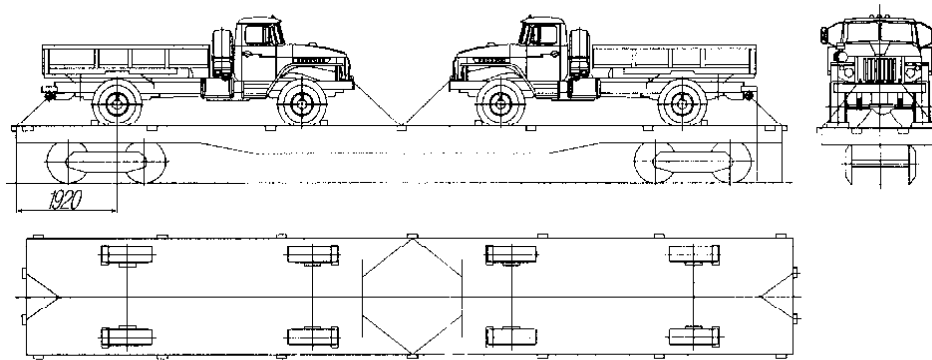


Fig. 141- Loading and securing of the trucks on a four-axle flat-car (for 4x4 trucks)

10.3 When transporting the trucks by air, preparatory works should be done and truck cushioning should be additionally disengaged by special devices manufactured and supplied by a consignor. The design of the devices, which disengage the cushioning, should prevent their falling out, when vibrations occur, and the selected material should prevent crumpling as it can result in truck unfastening.

The truck fuel tanks should be half-filled. Place and fasten the truck as per special diagrams.

10.4 When transporting the trucks by water, load the truck without any cargo in its body.

Loading, placing and fastening of the truck with special equipment mounted on its chassis are described in the Operation Manual for the corresponding component.

The trucks are transported by sea vessels in all the cargo spaces (holds, twin decks); the trucks are transported on the top deck with the consent of the cargo owner (consignor).

Place the trucks in the cargo hold and on the deck so, that the distance between them is 250 mm min on the radiator side and 130 mm min on the other sides.

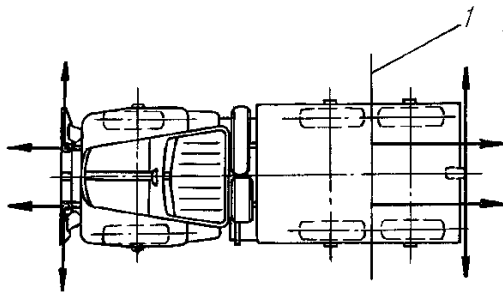
Upon placing the truck on a sea vessel, perform the preparatory works; fasten the truck to prevent its longitudinal and lateral motion with special mooring devices available or with guy ropes. Tighten the guy ropes by twisting their threads with the help of tommy bars until the truck is fixed reliably. Loosening of the guy ropes or their separate threads is not permissible.

Fasten the guy ropes to the front towing hooks, equalizing beam suspension pin and rear tow-bar. The fastening variants are shown in Figures 142, 143.

On a bolster-type truck, the guy ropes should be fastened on the rear towing hooks. The mooring devices or guy ropes should not be in contact with the truck tires. To prevent lateral displacement of the truck on the sea vessel, put brake blocks under the truck wheels.

Arrange and fasten the trucks as per vessel layout requirements.

Locating and fastening the truck for transportation is the responsibility of cargo carrier.



1-Walking beam axle (for 6x6 trucks), rear axle axis (for 4x4 trucks)

Fig. 142 – Securing of truck on weather deck

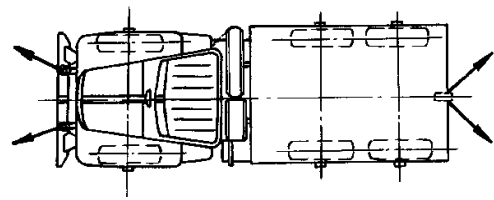


Fig. 143 – Securing of truck in cargo hold

11 Recycling

Upon expiry of truck service life, it is subject to recycling. For this purpose follow the procedure:

- wash and dry the truck;
- remove storage batteries and check whether they are further serviceable. If not, pour off the electrolyte into special glassware and bring the storage batteries to a collecting station;
- drain coolant from the engine cooling system into a special vessel;
- drain oils from the truck units and remove the rest of oil from the filling hollows of the units with the help of steam-air installation;
- dismantle wiring from the truck and bring it to a collecting station;
- remove wheels, plastic and rubber parts from the truck and bring them to a collecting station;
- dismantle the truck units, disassemble them, detect defective parts and bring the parts, which are not suited for application as spare parts, to a collecting station.

The brake equipment which is subject to recycling should be disassembled. The parts are to be assorted according to types of materials. Depending on wear-out rate, particular parts can be used for similar equipment repairing; the rest is to be collected as scrap.

When preparing a truck for recycling, observe safety precautions described in the section «Safety Requirements».

When working with toxic and dangerous materials, fulfill general technical requirements for their handling.

APPENDICES

APPENDIX A (recommended)

Table A.1 – Torques Applied for Tightening if the Main Threaded Connections, N.m (kgf.m)

A.1 Engine	
Nuts fastening:	
silencer	24-36 (2,4-3,6)
silencer inlet pipes to exhaust manifolds	28-36 (2,8-3,6)
Lock nuts fastening silencer inlet pipes to exhaust manifolds	33-41 (3,3-4,1)
Bolts attaching the side supports of the power unit	50-62 (5,0-6,2)
Bolts fastening the front support beam of the power unit	80-100 (8-10)
A.2 Transmission	
Bolts fastening the clutch master cylinder M12	44-56 (4,4-5,6)
A.2.1 Transfer Box	
Nuts fastening bearings of primary, intermediate shafts and differential rear holder, min	200 (20)
Nuts of transfer box flanges, min	200 (20)
Bolts fastening:	
differential washers	24-36 (2,4 -3,6)
differential rear holder	55-65 (5,5-6,5)
bearing caps of primary and intermediate shafts	40-56 (4,0-5,6)
case of differential rear bearing	44-62 (4,4-6,2)
bearing cap of rear axle drive shaft	40-56 (4,0-5,6)
bearing cap of front axle drive shaft	30-35 (3,0-3,5)
Oil level inspection plugs:	
MK24x1,5	100-140 (10-14)
K 3/8"	80-120 (8-12) ^{*1}
Drain plug	100-140(10-14)
A.2.2 Cardan Drive	
Nuts of bolts fastening:	
flanges of cardan shafts of intermediate axle and intermediate cardan shaft	160-200(16-20)
flanges of cardan shafts of front and rear axles drive	120-160 (12-16)
Intermediate support and spacer	180-220 (18-22)
A.2.3 Drive Axles	
Bolts fastening:	
final drive to axle case:	
M16	160-200 (16-20) ^{*2}
M18	190-230(19-23)
caps of through shaft and bearing bodies of driving bevel and cylindrical gears	60-80 (6,0-8,0)
^{*1} Applicable to trucks without auxiliary power take-off.	
^{*2} With availability of M14 bolts maintain a torque of 120-150 N·m (12-15 kgf·m).	

Table A.1 Continuation

bearing body caps of driving bevel gear and steering knuckle seal	12-18 (1,2-1,8)
side cover of the final drive	44-56 (4,4-5,6)
differential bearing caps	250-320(25-32)
Nuts fastening:	
final drive to axle case	120-150 (12-15)
ball support to half-axle casing	280-320 (28-32)
steering knuckle levers and kingpin bearing caps:	
M18	160-200 (16-20)
front axle slewing journals	190-230 (19-23)
final drive flanges	250 (25)
differential cups	250-320 (25-32)
rear axle brake shield	160-200 (16-20)
Nut and lock nut of driving bevel gear bearings	450-500 (45-50)
Nuts of wheel hub bearings	300-350 (30-35)
	Loosen by 1/8-1/6 of a turn, max
Lock nuts of wheel hub bearings	400-500 (40-50)
Oil level inspection plugs in steering knuckles, in axle case	100-140 (10-14)
Drain plug in axle case	100-140 (10-14)
A.3 Running gear	
A.3.1 Suspension	
Nuts of torque rod pins, min (for 6x6 trucks) (in case the holes for cotter pin do not match, tighten up the nut)	600 (60)
Nuts of eye bolts of front springs (for 4x4 & 6x6 trucks) and rear springs (for 4x4 trucks)	400-500 (40-50)
Nuts of eye U-bolts of front springs (for 4x4 & 6x6 trucks) and rear springs (for 4x4 trucks)	180-220(18-22)
Wedge nut fixing fingers of front springs	28-36 (2,8-3,6)
Nuts of clamping bolts of rear brackets of front springs (for 4x4 & 6x6 trucks) and rear springs (for 4x4 trucks)	180-220 (18-22)
Nuts fastening:	
front springs U-bolts (fully loaded truck)	400-500 (40-50)
rear springs U-bolts (for fully loaded 4x4 truck, for equipped 6x6 truck)	580-660 (58-66)
shock absorbers (in case the holes for cotter pin do not match, tighten up the nut)	40 (4)
shock absorbers bodies	120-150 (12-15)
Centre bolt of front spring	70-100 (7-10)
Centre bolt of rear and additional spring (for 4x4 trucks)	70-100 (7-10)
Bolts fastening:	
walking-beam brackets to cross-member (for 6x6 trucks)	110-160 (11-16)
bracket of upper torque rod to axle beam (for 6x6 trucks)	250-320 (25-32)
front brackets of front springs (for 4x4 & 6x6 trucks) and rear brackets of rear springs (for 4x4 trucks) to the bottom flange of the side-member	120-160 (12-16)
rear brackets of the front springs to the side-members reinforcement	180-220 (18-22)

Table A.1 Continuation

walking-beam axis assembled with walking-beam brackets (for 6x6 trucks)	700-800 (70-80)
rear springs pins cover (for 4x4 trucks)	180-220 (18-22)
Tie bolts of walking-beam nuts (for 6x6 trucks)	44-56 (4,4-5,6)
A.3.2 Towing unit	
Bolts and nuts fastening:	
towing device to the crosspiece	110-140 (11-14)
rear towing cross member to the frame:	
M16	160-220(16-22)
M14	110-160(11-16)
locking plate	28-36 (2,8-3,6)
A.3.3 Wheels	
Wheel fastening nuts	400-500 (40-50)
Tube valve nut	18-30 (1,8-3,0)
A.4 Steering	
Nuts fixing:	
ball pins of steering tie rods and booster, min	240 (24) with tightening up to matching of the nearest nut slot and cotter pin hole
steering pitman arm	400-450 (40-45)
Bolts fixing steering gear to truck frame:	
M16	110-140 (11-14)
Bolts fixing steering cardan forks M10	44-56 (4,4-5,6)
Steering wheel fastening nut	80-100 (8-10)
A.5 Brake System	
Brake chambers fastening nut	300-320 (30-32)
Brake shoe pins fastening nut	431-490 (44-50)
Brake shoe pin lining fastening nuts	224-313 (28-32)
Wedge mechanism body fastening bolts	79-85 (7,5-8,5)
Spring brake fastening nuts	300±20 (30±2)
A.6 Electrical equipment	
Alternator pulley fastening nut	60-80 (6-8)
Brake signal switch BK12E, max	24,5 (2,45)
Secondary brake release switch 2802.3829, max	30,0 (3,0)
Vessel air pressure drop sensor 6072.3829, max	30,0 (3,0)
A.7 Cab	
Nuts of cab fixing bolt	40-60 (4-6)
Lock nut of cab fixing bolt	120-140 (12-14)
A.8 Fifth wheel	
Fifth wheel bolts:	
M14	80-90 (8-9)
M16	120-140 (12-14)

Table A 1 Ending

A.9 Special equipment	
A.9.1 Power take-off	
Bolts and nuts fixing power take-off case to gearbox case	22-32 (2,2-3,2)
A.9.2 Auxiliary power take-off	
Nut of auxiliary power take-off flange, min	140 (14)
A.9.3 Winch	
Bolts of winch cardan shaft flanges	60-65 (6,0-6,5)

APPENDIX B (recommended)

Table B. 1 - The data for the control and adjustment

Coolant temperature in cooling system, °C	90-100
Axial displacement of primary and intermediate transfer box shafts, mm	0,03-0,08
Free steering wheel travel (with the pump running)	≤25°
Toe-in (the rim), mm	1-3
Travel of clutch pedal, mm: free full	5-10 185-190
Travel of brake pedal, mm: free	20-30
Air pressure in air system, kPa (kgf/cm ²)	
Pressure governor:	
max pressure at switching off	870 kPa (8,7 kgf/cm ²)
min pressure at switching on	720 kPa (7,2 kgf/cm ²)
Four circuit protective valve:	
circuit static shut-in pressure	450 kPa (4,5 kgf/cm ²)
Trailer brake control valve:	
corresponding inlet and outlet pressure	210 kPa (2,1 kgf/cm ²)
at control pressure	150 kPa (1,5 kgf/cm ²)

APPENDIX C

(reference)

Table C. 1 – Data on weight of main components, kg
(Without refueling, lubricants and hydraulic fluids)

Transfer box	200
Drive front axle with hubs, brakes and steering rod	718
Rear / intermediate axle with hubs and brakes	612
Truck frame:	
short	626
long	875
Towing unit	60
Front spring of truck (for 4x4 & 6x6 truck):	
the load on the axle over 5800 kg up to 6300 kg	83,7
the load on the axle over 4800 kg up to 5300 kg	80,3
Rear spring of truck (for 6x6 trucks):	
with load on the bogie up to 12000 kg	116,5
with load on the bogie over 12 000 kg	108,9
Rear spring of truck (for 4x4 trucks)	101,7
Additional spring (for 4x4 trucks)	33,3
Walking-beam axle assembly	149
Wheel 515-254 (254Г-508)	56
Wheel 514-400 (400Г-508)	68,7
Wheel 8,5-20	47,8
Tire 14.00-20 model ОИ-25	112
Tire 390/95R20 KAMA-УРАЛ, max	120
Tire 390R20 model О-65, max	120
Tire 12.00R20, У-4, ИД-304	90
Steering gear (worm-side segment)	39
Steering gear (screw-ball nut-rack-segment)	27,1
Parking brake	22
Storage battery TITAN STANDART 6CT-190OL (ST) or 6CT-190N3	57,2
Power take-off with pump	24,2
Power take-off with flange	15,9
Auxiliary power take-off	15,3
Winch with reduction gear	287
Winch rope with hook	100
Platform body:	
short	980
long	1210
Platform body canopy	33,5
Cab	428
Hood and fenders	120,38

APPENDIX D (reference)

Rolling bearings

Table D.1 – Rolling bearings of trucks

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity
307A	Single-row radial ball bearing	35x80x21	Power take-off driven shaft	2
64805	Single-row radial roller bearing without races	25x38x24,7	Power take-off driving gear	2
211A	Single-row radial ball bearing	55x100x21	Auxiliary Power take-off shaft (front support)	1
50208A	Ditto	40x80x18	Ditto (rear support)	1
804807K3C10 or 804707AC10	Roller needle bearing	33,65x50x31 33,65x50x37	Spiders of intermediate cardan shaft, of intermediate axle drive cardan shaft	16
804707A1C10* ²	Ditto	33,65x50x37	Spiders of intermediate cardan shaft, of intermediate axle drive cardan shaft with end slots	16
50311A	Single-row radial ball bearing	55x120x29	Front axle drive shaft of transfer box, shaft of reinforced auxiliary power take-off (rear support)	2
7312A	Single-row tapered roller bearing	60x130x33,5	Transfer box primary shaft, winch drum shaft	3
7610A	Ditto	50x110x42,25	Transfer box intermediate shaft	2
7310A or 6-7310A1	-«-	50x110x29,25	Final drive cylindrical driving gear	6
220A	Single-row radial ball bearing	100x180x34	Transfer case differential	1
6-218	Ditto	90x160x30	Ditto	1
Б11,112-100	Ball		Transfer case control	2
12311K1M	Radial roller bearing with short cylindrical rollers	55x120x29	Final drive pinion shaft (rear support)	3
6-7515A	Single-row tapered roller bearing	75x130x33,25	Differential, final drive driving gear shaft (front support)	7

Table D1 Continuation

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity
2007124A or 6-200712AA 2007118K1	Ditto	120x180x38	Wheel hubs	12
	Single-row tapered roller bearing	90x140x32	Intermediate and rear axles final drive differentials	2
12318KM	Radial roller bearing with short cylindrical rollers	90x190x43	Final drive driven bevel gear	3
7516A or 6-7516A	Single-row tapered roller bearing	80x140x35,25	Final drive driving gear shaft (front support)	3
804805K1	Roller needle bearing	25x39x30,5	Spiders of cardan shafts of front and rear axle drive	16
311A	Single-row radial ball bearing	55x120x29	Rear axle drive shaft of transfer case, lead screw of winch rope winding guide	3
6-312A	Single-row radial ball bearing	60x130x31	Transmission cardan shaft intermediate support	1
704902K6ÓC10	Roller needle bearing	15,2x28x20	Spiders of steering cardan shaft	16
220A	Single-row radial ball bearing	100x180x34	Transfer case differential	1
218 or 218A	Ditto	90x160x30	Ditto	1
180206AC17	-«-	30x62x16	Intermediate support of steering cardan shaft	2
636906C17	Radial roller thrust pressed bearing w/o separator	28x42x21	Steering column	2
108710KC17	Single-thrust ball bearing	50x80,5x23	Front axle steering knuckle	2
12309KM	Radial roller bearing with short cylindrical rollers	45x100x25	Ditto	4
6-180603K2C9	Single-row radial ball bearing	17x47x19	Generator (rear support)	1
6-1180304K2C9	Ditto	20x52x18	Generator (front support)	1
804704K3C10	Roller needle bearing	22x35x26,5	Spiders of cardan shafts of winch drive	16

Table D1 Ending

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity
180508K2C17	Single-row radial ball bearing	40x80x23	Intermediate cardan shaft of winch drive (supporting bearings)	2
46310AK	Single-row radial thrust ball bearing	50x110x27	Winch reduction gear worm (front support)	1
312A	Single-row radial ball bearing	60x130x31	Winch reduction gear worm (rear support)	1
8311	Single-row thrust ball bearing	55x105x35	Ditto	1
7216A	Single-row tapered roller bearing	80x140x28,5	Winch drum shaft	1
8103 or 8903	Single-row thrust ball bearing	17x30x9	Spare wheel lift reduction gear	1
I-941/12K	Roller needle bearing State Standard GOST 4060-78	12x17	In pedal gear	2
I-943/25K	Roller needle bearing State Standard GOST 4060-78	25x32	In pedal gear	4
* Inside diameter x outside diameter x mounting width.				

APPENDIX E

(reference)

Table E.1 – Chart of lubricants and working fluids

Main grade		Substitute		Quantity of single refueling per truck	
Designation	Standard	Designation	Standard	Truck 4x4	Truck 6x6
1	2	3	4	5	6
Diesel fuel	GOST P 52368-2005 type II or III	See Operation Manual for the engine		See Specification	
Transmission oil ТСП-15К	GOST 23652-79	Oils ТСП-10, ТАп-15В, МТ-16п	GOST 3652-79	27,2 l	34,0 l
SAE 5W; 10W; 15W-40; APICI-4 engine oil	See Operation Manual for the engine			23,0 l	
Oil grade «Р»	Specifications 38 101 1282-89	Spindle oil АУ	Specifications 38 101 1232-89	5,8 l	
Oil ВМГЗ	Specifications 38.101479-00	Hydraulic Oil «Р»	Specifications 38.1011282-89	3,9 l	
Litol-24 lubricant	GOST 21150-87	Solid oil Ж, Solid oil С, АМ grease gimbal, Зимол lubricant, 158 lubricant	GOST 1033-79 GOST 4366-76 Specifications 38 590 1302-91 Specifications 38 УССР 201285-82 Specifications 38 101 320-77	8,0 kg	10,38 kg
Graphite lubricant УССА	GOST 3333-80	Solid oil Ж, Solid oil С, Litol-24 lubricant	GOST 1033-79 GOST 4366-76 GOST 21150-75	1,93 kg	
ВНИИ НП 510 lubricant	Specifications 38 101 910-82			0,008 kg	
Lukoil-AЖ shock absorber	Specifications 0253-025-00148599-2001	ГРЖ-12	Specifications 0253-048-05767924-96	3,4 l	1,7 l
«ММБ» brake fluid	Specifications 6-01-1276-82	brake fluid «Нева», «Роса», ГТЖ-22М	Specifications 6-01-34-93 Specifications 2451-004-104-8805 7-94 Specifications 6-01-787-86	2,3* l 0,5 l	

Table e1 Ending

1	2	3	4	5	6
Ethanol	GOST 18300-72 GOST 17299-76			0,262 kg	
Coolant Cool Stream Standart 40	Specifications 2422-022- 13331543-2004	See Operation Manual for the en- gine		27,0l	
ДТ-1 lubricant		«Нева» brake fluid		0,12kg	
Лита lubricant	38-101- 1308-90 Specifications	ЦИАТИМ- 201 lubricant	GOST 6267-74 Specifications 38 УССР 201285-82	0,29 kg	0,39 kg
* For trucks with air-hydraulic drive					

APPENDIX F
(recommended)

Table F.1 - Truck bulbs and their specifications

Location	Lamp type	Q-ty per truck
Headlamp	AKΓ24-75+70-1	2
Front lamp	A24-21-3	2
	A24-5	2
Rear lamp	A24-5	2
7442.3716	A24-21-3	6
Side repeater	A24-21-3	2
Cab roof lamp	A24-21-3	1
Signal, pilot and instrument illumination lamps	A24-2	19
Front marker lamp	A24-5-1	2
Number plate lamp	A24-5	2
Road train sign lamp	A24-5	3
Flood head lamp	AKΓ24-70	1
Emergency light signaling switch	AMH24-3	1

APPENDIX G
(reference)

Table G.1 - Waste oil collection rate, l

Engine	18,0
Gearbox	7,3
Transfer box	2,7
Steering gear case	1,2
Drive axle reduction gears	19,0; 13,0*
Steering hydraulic system	3,0
Winch reduction gear	6,3

* On trucks with 4x4 wheel arrangement

APPENDIX H

(reference)

H.1. Spare parts, tools and accessories

The Manufacturer supplies each truck with a single set of spare parts, tools and accessories.

On special request the Manufacturer can supply the following sets:

- a set of spare parts, tools and accessories (SPT&A) for power unit, that contains the spare parts intended for elimination of troubles during the warranty period of operation, as well as tools and accessories;

- a set of accessories (portable lamp, hand pump for fuel transfer, lever type grease gun);

- a set of tools (fitting and assembly tools, manufactured according to State Standard GOST requirements).

The warranty period of preservation treatment of SPT&A sets is three years, provided the sets are stored in closed rooms.

Owing to continuous modification process of truck design, the range of spare parts of SPT&A sets can differ. The more precise range of spare parts is given in the shipping documents supplied with each truck.

When shipping the trucks the SPT&A-0 is put in the transportation box of SPT&A. Recommendations for the in-service location of the tools and accessories on the truck are given in the present Section.

The location of tools and accessories relating to the equipment mounted on the truck chassis is determined by the equipment Manufacturer.

Trucks chassis is not equipped with fire extinguisher, first aid kit, and emergency warning triangle.

When operating the truck the tools and accessories location can be determined by the driver himself.

Table H.1 - Location of tools and accessories in the Ural trucks

Position in Fig.	Description	Quantity
In tool bag 12 (Fig. H.1)		
1	Bench hammer 1000 g	1*
2	Chisel	1*
3	Driftpin	1*
4	Set of puller for pipes dismantling	1
5	The head of the key for 50	1* ¹
6	Ring spanner 65-70	1
7	Box spanner 24x27	1*
8	Union pipe	1
9	Socket wrench 27x38 for wheels	1
10	Socket wrench 19x22 special	1
11	Socket wrench 30x32	1
12	Tool bag	1
13	Wrench for hydraulic brake bleeding 12	1* ²
14	Socket wrench 6	1
26	Socket wrench 19x22	1

Table H.1 Continuation

Position in Fig.	Description	Quantity
In tool bag 26 (Fig. H.1)		
15	Pliers	1
16	Box wrench 22x24	1*
17	Box wrench 17x19	1*
18	Wrench 27x30	1*
19	Wrench 22 x24	1*
20	Wrench 19x22	2*
21	Wrench 14x17	1*
22	Wrench 11x13	1*
23	Wrench 10x12	1*
24	Wrench 8x10	1*
25	Wrench 5,5x7	1*

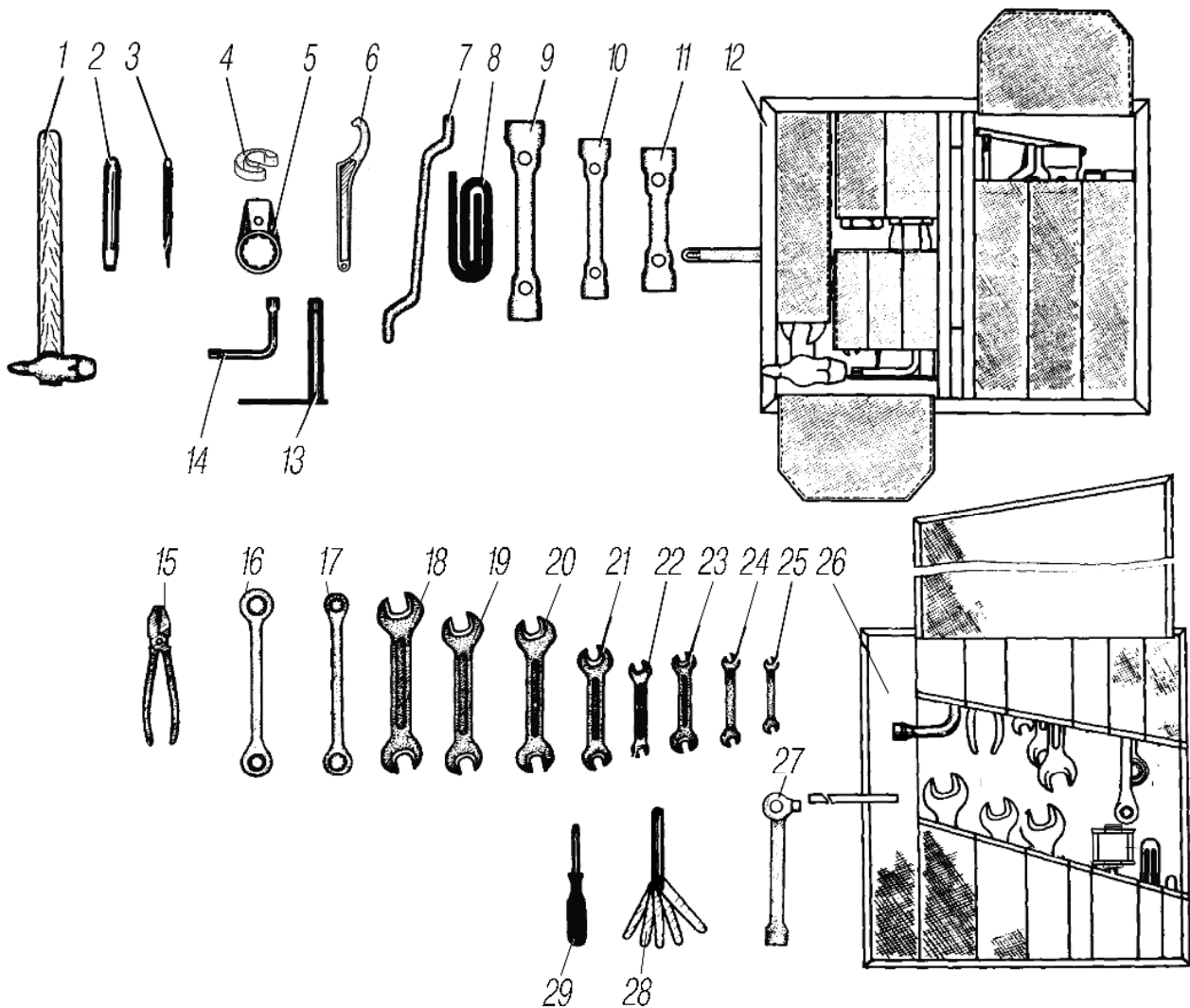
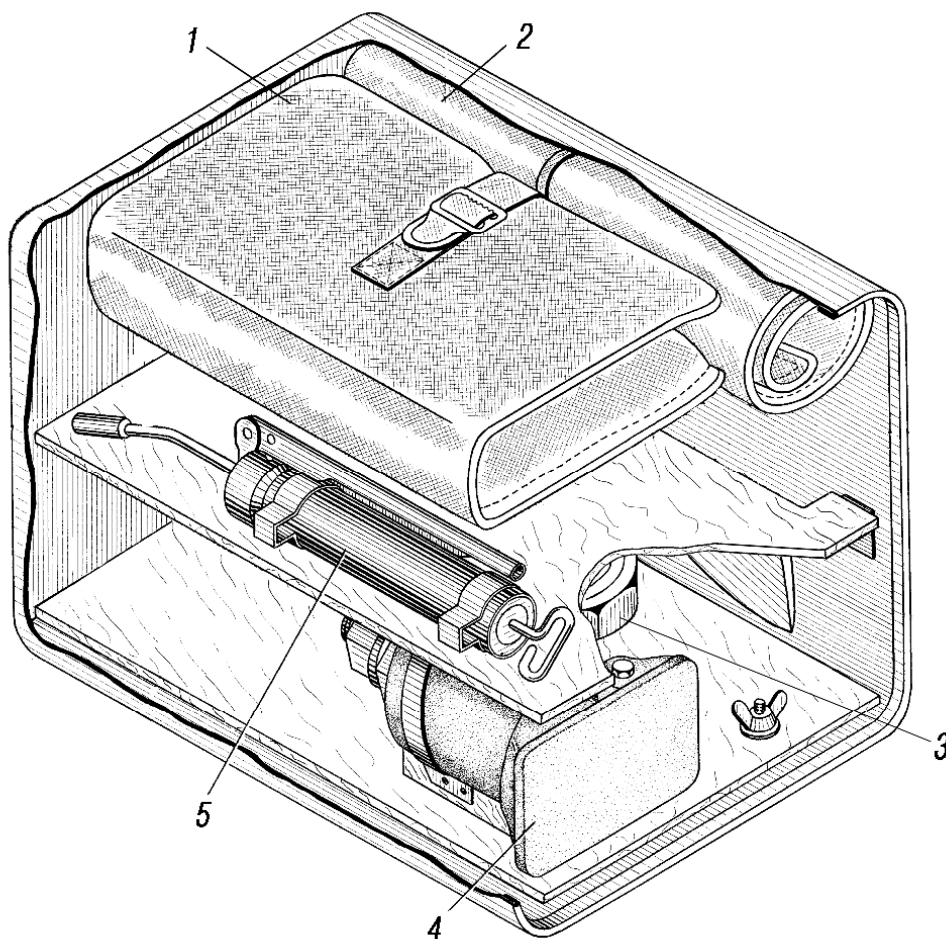


Fig. H.1 - Tools of the Ural truck

Table H.1 Continuation

Position in Fig.	Description	Quantity
26	Tool bag	1
27	Socket wrench 24	1
28	Special feeler gauges	1
29	Combination screwdriver	1
In tool box (Fig. H.2)		
1,2	Tool boxes	1
3	Socket wrench 140	1
4	Hydraulic jack 8 t	1
5	Lever type grease gun	1*
-	Connecting head of B type with union	1
-	Air hose	1
-	Spare wheel holder winch lever	1
The following items are mounted under the body		
-	Tire iron	1



1, 2-tool bags; 3-socket wrench 140; 4-jack; 5- lever type grease gun

Fig. H.2 – Tool Box

Table H.1 Ending

In glove compartment		
-	Operation Manual	1
On platform		
-	Spacer pipes	1
In cabin		
-	Canopy in a bag	1
In special seats in the front part of the platform		
-	Canopy bows (set)	1
-	Warm-keeping jacket for radiator and side panels	1
* Supplied upon customer's request *¹ For trucks with 6x6 wheel arrangement *² For trucks with air-hydraulic brake drive		

H.2 Hydraulic telescoping brake

H.2.1 Specifications

Type	hydraulic, telescopic, with two working plungers
Lifting capacity, kN (tf)	80 (8)
Jack height with plungers lowered and the screw turned in, mm	270
Height of load lift, mm	285
Oil volume, l	0,7

For lifting a load with the jack:

- set the jack in the required position, turn out screw 1(Fig. H.3) by the required amount.

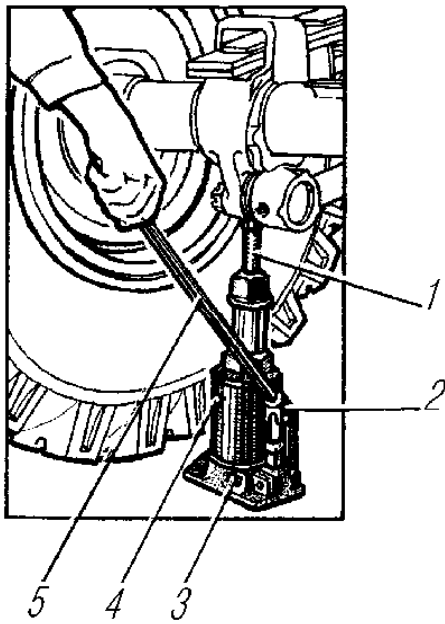
If the ground is soft, place a strong wooden board or some other flat object under the jack base beforehand;

- make some quick pumping strokes of lever 2, shut-off needle 3 being screwed out;
- using a tire iron, screw home the shut-off needle turning it clockwise;
- raise the working plungers as required rocking the tire iron fitted into lever 2.

Should the jack fail to operate due to seized valves, slightly knock at the delivery plunger lever with the tire iron.

For lowering the load:

- slowly screw out the shut-off needle turning it counter-clockwise;
- screw out plug 4 and let out the air; upon lowering, screw the plug home.



1 - screw of inner working plunger; 2 - pump lever; 3 - shut-off needle; 4 - plug; 5 - tire iron

Fig. H.3 - Using jack

When using the jack place pads under the truck wheels. Be sure to apply the parking brake and to engage the lower gear in the gearbox.

For lifting the front axle, set the jack screw head in the recess on the clip fastening the spring; for lifting the rear or intermediate axle set it under the spring support bracket.

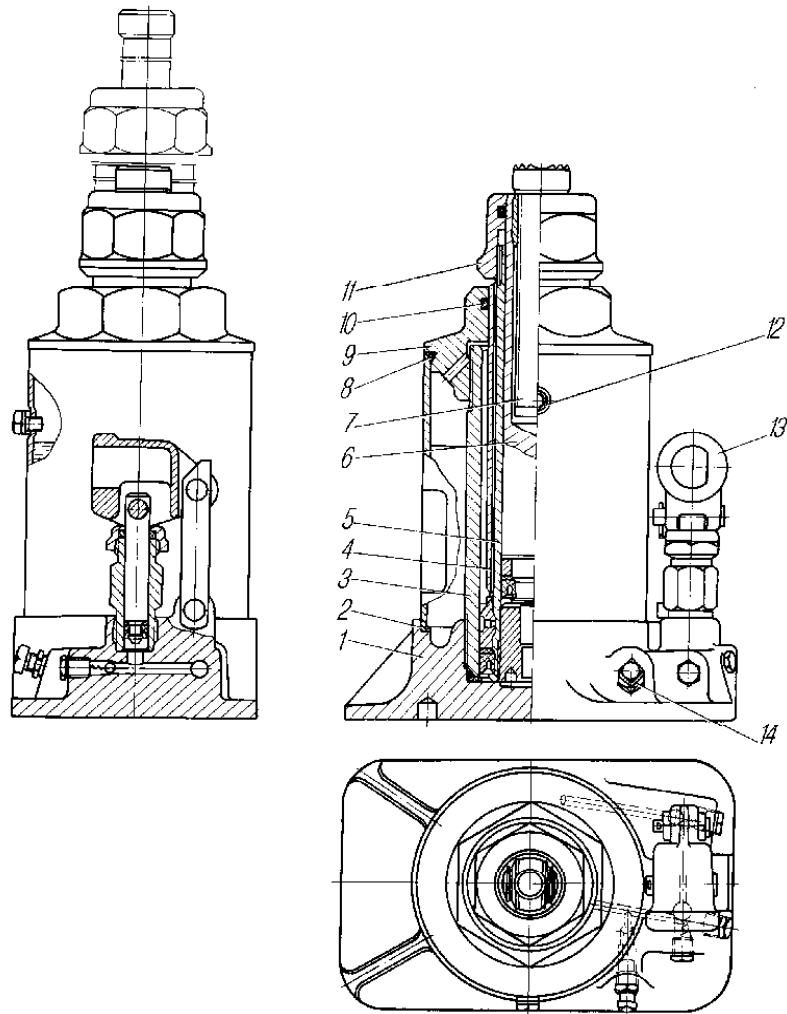
When the jack is out of operation the head screw should be turned in, the working and delivery plungers lowered and the shut-off needle screwed out.

If oil seeps through plungers or shut-off needle, tighten collar nuts, and eliminate oil leaks through joints of casing parts by tightening the casing head.

Do not raise the working plungers by hand when the shut-off needle is screwed home; otherwise air can enter the jack working chamber.

If the jack fails to ensure the plunger's full working stroke, check the oil level. Add oil up to the filler closed with plug 4 after lowering the jack plungers completely and the jack standing upright. See the jack mechanism on Fig. H.4.

If the jack fails to operate due to dirt accumulated on parts of the working chamber, drain soiled oil through the filler, fill kerosene and pump the jack through after screwing out the shut-off needle. Then, on draining the kerosene, fill filtered oil, BMГ3 grade. The jack may be filled with MKE-10A oil.



1 - base; 2 - gasket; 3 - cylinder of outer working plunger; 4 - cylinder pipe; 5 and 6 - outer and inner working plungers; 7 - screw; 8 - seal; 9 - case head; 10 - packing ring; 11 - plunger head; 12 - plug; 13 - pump lever; 14 - shut-off needle

Fig. H.4 – Jack

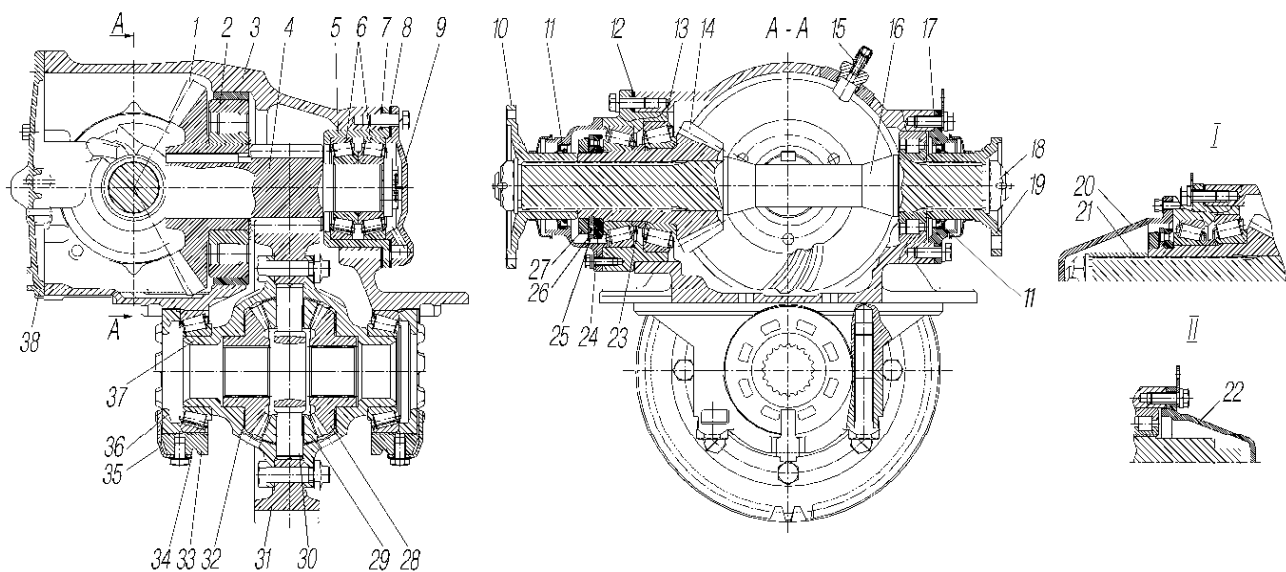
APPENDIX I (recommended)

I.1 Design features of trucks with air-hydraulic brake system and RBL C-700 steering mechanism

I.1.1 Transmission

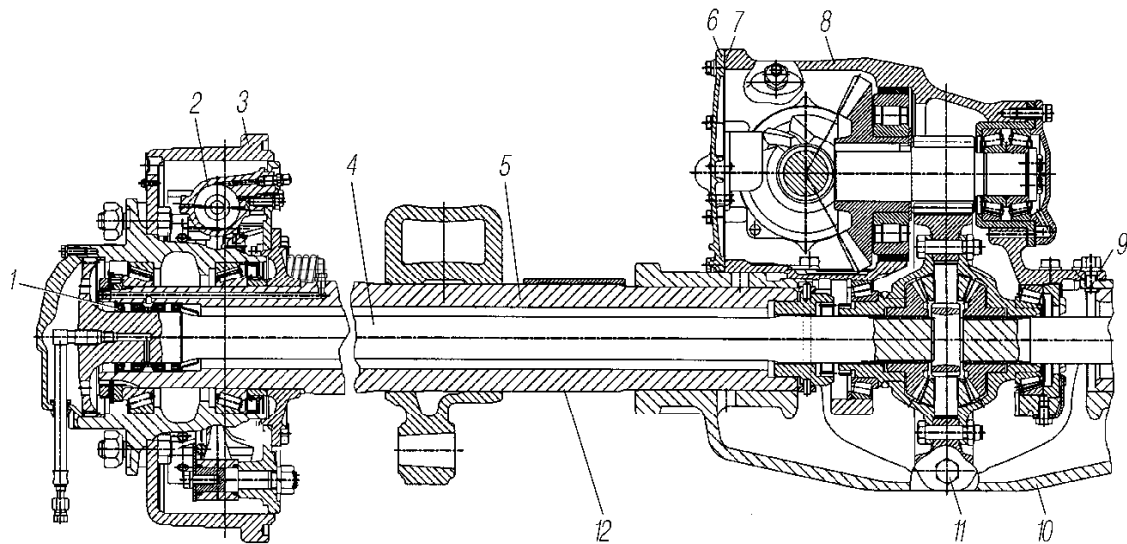
I.1.1.1 Driving axles

I.1.1.1.2 Final drive of the intermediate axle is double; consists of two bevel pinions 1 and 14 (Fig. I.1). Final drive is characterized by mounting holes in differential carrier. Rear driving axle is shown on Fig. I.2.



1-driven bevel pinion; 2-cylindrical roller bearing; 3-main gear housing; 4-drive bevel pinion; 5-bearing cage; 6-helical roller bearings; 7,8,12-shim washers; 9-bearing cage cover; 10-rear axle drive flange; 11-sleeve; 13-drive bevel pinion bearing cage; 14-drive bevel pinion; 15-breather; 16-pinion drive shaft; 17-gasket; 18-flange nut; 19- front axle drive flange; 20- front bearing cap; 21- spacer; 22-rear крышка bearing cap; 23- adjusting washer; 24-nut; 25- tightening washer; 26- locking washer; 27-locknut; 28- axle shaft gear; 29- differential satellite gear; 30- differential spider; 31- driven spur wheel; 32- backup washer; 33- differential bearing cap; 34-locking plate; 35-locking disk; 36-differential bearing adjusting nut; 37-differential carrier; 38-crankcase cover; I-for the front axle; II-for the rear axle

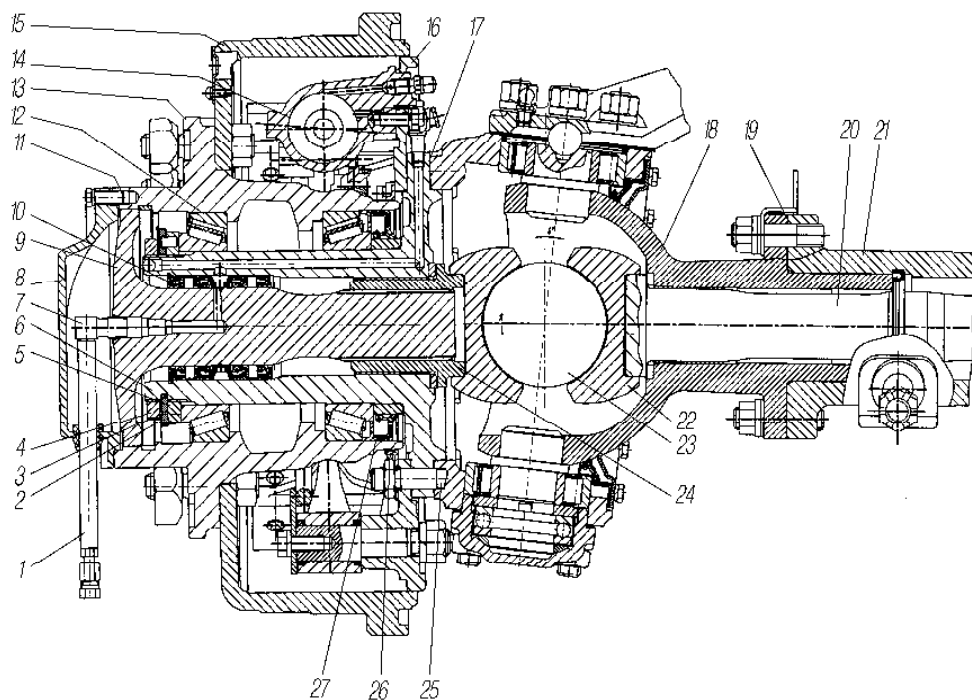
Fig. I.1 – Final drive



1-air supply sleeve; 2-wheel cylinder; 3-brake drum; 4-semi-axle; 5-supporting spring bracket; 6-crankcase cover; 7,9-gaskets; 8-main gear; 10-axle case; 11-drain plug; 12-semi-axle housing

Fig. I.2 - Rear drive axle

I.1.1.1.3 The front axle of the truck is the driving and controllable axle. The design of the front axle pivot unit is shown in Fig. I.3.



1-air supply hose; 2-locking washer; 3-retaining ring; 4-locknut; 5-wheel bearing nut; 6-swivel stud; 7-air supply angle joint; 8-hub cap; 9-outer semi-axis; 10-sleeve unit; 11,17,19-sealing gaskets; 12-bearing; 13-hub; 14-brake wheel cylinder; 15-brake drum; 16-brake support; 18-spherical joint; 20-inner semi-axis; 21-semi-axis housing; 22-joint eccentric; 23-joint disk; 24-outer semi-axis fork; 25-pin; 26-reflector; 27-sleeve

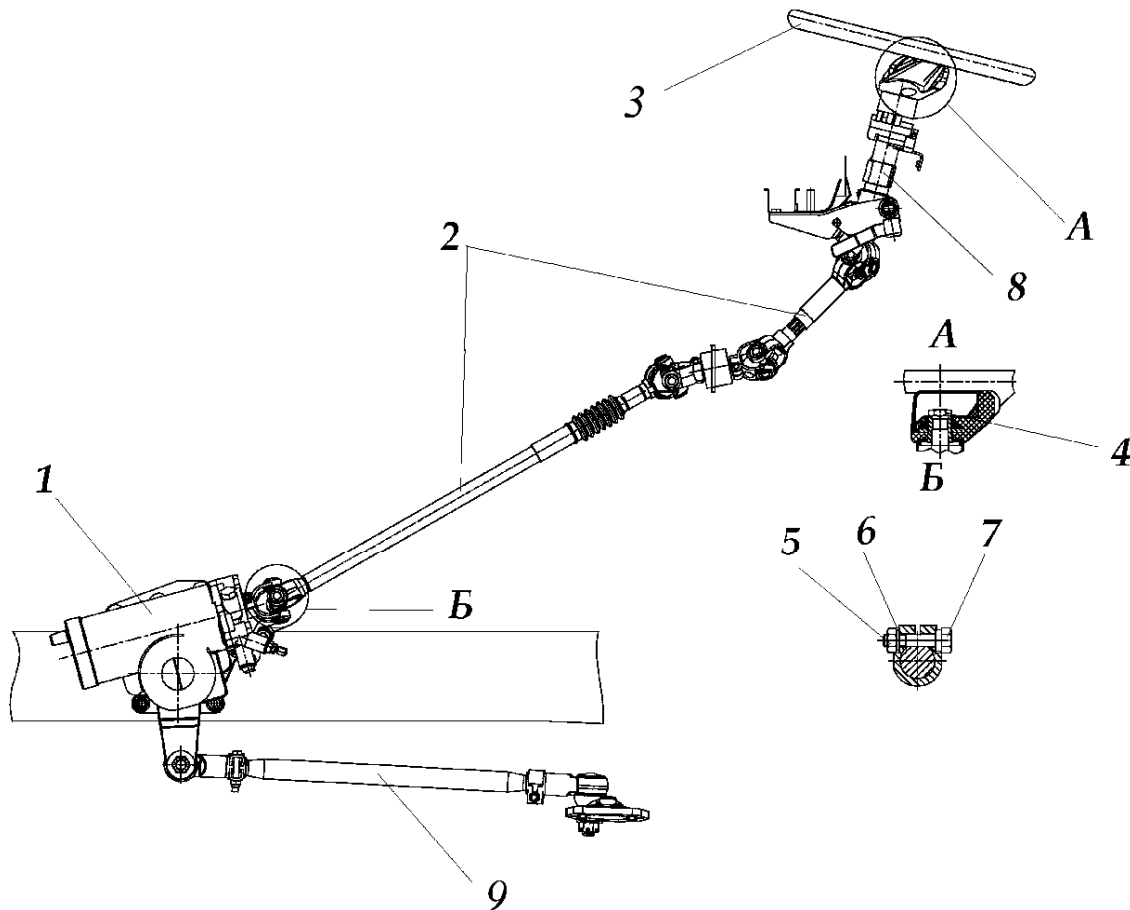
Fig. I.3 –Steering wheel drive of the front drive axle

I.1.2 Steering

I.1.2.1 Steering gear

Steering gear is shown in Fig. I.4 and consists of steering linkage and the hydraulic booster. Steering linkage includes steering column, mechanical part of the steering gear, drop arm, drop arm rod, steering arm, steering knuckle lever, and steering levers.

Рулевой привод включает в себя колонку рулевого управления, механическую часть рулевого механизма, сошку, тягу сошки, тягу рулевой трапеции, рычаг поворотного кулака и рычаги рулевой трапеции.



1-steering gear with drop arm; 2-propeller shafts; 3-steering wheel; 4,5-nuts; 6-washer; 7-bolt; 8-steering column; 9-drop arm rod

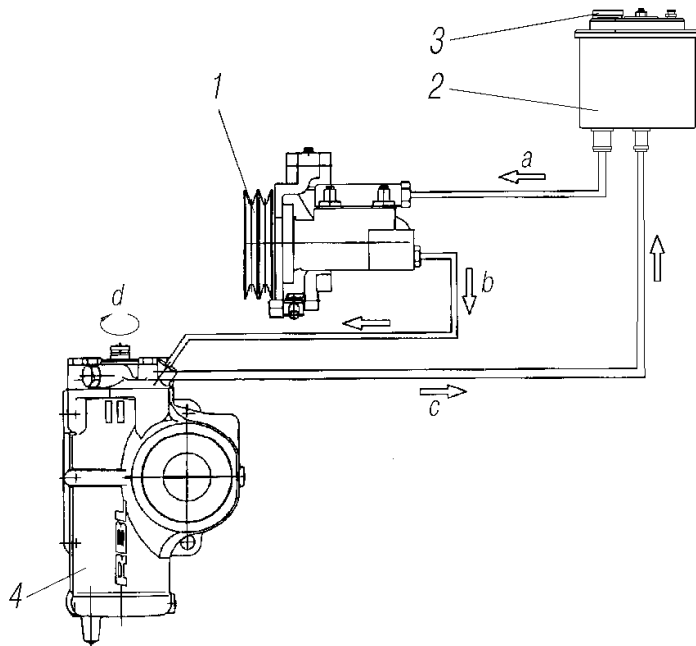
Fig. I.4 - Steering

I.1.2.1.1 Hydraulic system of the steering (hydraulic booster) is shown in Fig. I.5.

I.1.2.1.2 Steering gear with built-in integral hydraulic booster. Operating mechanism is screw-ball nut-rod-sector. Rod also acts as booster piston.

Drop arm shaft and rod gearing does not have side clearance in the intermediate position.

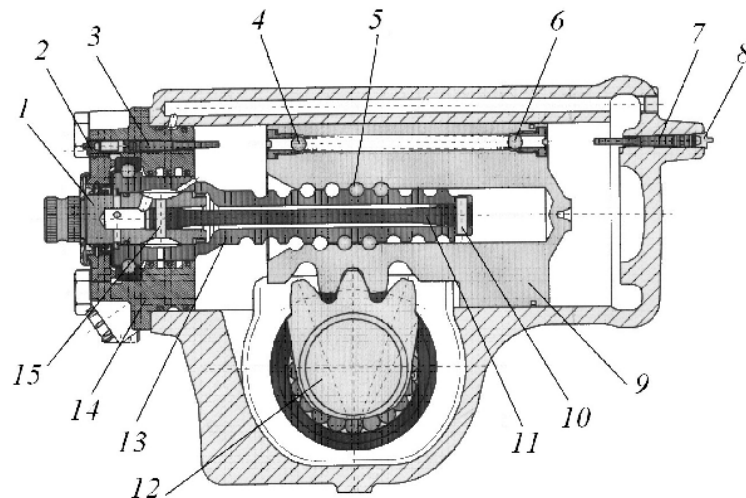
Mechanism has a valve consisting of a rotary valve 1 operating in worm 11 as shown in Fig. I.6. Rotary valve 1 and worm head 11 located in the valves case 12 have radial dosing grooves.



1-pump; 2-oil tank; 3-filler neck plug; 4-steering gear; a-feed; b,-pumping; c-drain; d-clockwise rotation of the shaft (example)

Fig. I.5 – Hydraulic circuit of the steering (hydraulic booster)

Rotary valve and torsion bar, torsion bar and worm are drilled together and fixed by pins 8 and 13. When no effort is applied to the steering wheel the torsion bar keeps the rotary valve in the neutral position. When an effort is applied to the steering wheel the torsion bar twists and turns the slide valve in the direction of the corresponding dosing grooves.



1-rotary valve; 2, 8-plugs; 3,7-pressure limitation adjusting screws; 4,6- pressure limitation valves; 5-balls; 9-piston; 10, 15-pins; 11-torsion bar; 12-arm shaft (sector); 13-worm; 14-valves case

Fig. I.6 – Steering gear

The oil from the pump flows into one of the piston cavities of the steering mechanism depending on the direction of rotation and increases the drop arm rotational movement through hydraulic pressure on piston surface.

Turning of the rotary valve relative to worm head is limited by stops.

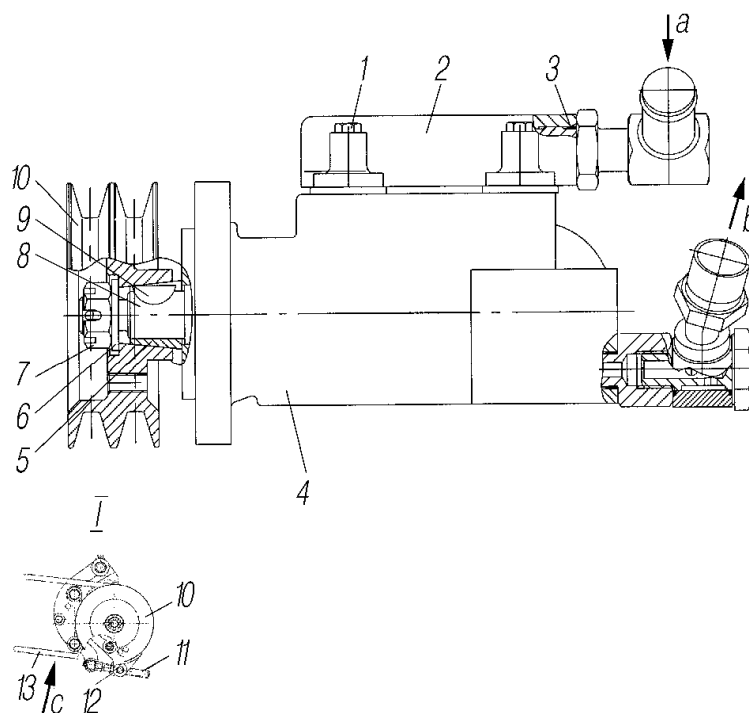
The steering gear is equipped with hydraulic limiters of the turning, which partially bypass the oil to drain when the wheels have not yet turned to the extreme position. Further turning of the steerable wheels will be with additional effort on the steering wheel.

I.1.2.1.3 Steering hydraulic booster pump is shown in Fig. I.7.

The steering booster pump is blade-type and bilateral. During pump shaft rotation the pump blades cling to the curved surface of the stator under the action of centrifugal force and oil pressure under the stator. In increasing spaces the oil flows into the space between the blades and is then expelled from the decreasing space with the rotor wheel rotation.

Two valves are located in the pump cap. The bypass valve limits the amount of oil delivered by the pump into the steering gear. The safety valve inside the bypass valve limits the oil pressure in the system by opening at the pressure of 15-16 MPa (150-160 kgf/cm²).

Control the hydraulic steering booster pump belt tension with the force of 40 N (4 kgf) in the middle of the branch in the direction of the arrow «c». The deflection of each belt shall be 6-11 mm. Adjust the belt tension with the screw 11 with subsequent locking by the nut 12.



1-bolt; 2-collector; 3-packing ring; 4-body; 5-bushing; 6-washer; 7-nut; 8-shaft; 9- segment dowel pin; 10-pulley; 11adjusting screw; 12-nut; 13-belt; I- pump installation; a-delivery; b-pumping; c-belt tension direction

Fig. I.7 - Steering hydraulic booster pump

I.1.2.1.4 Steering rods. Tie-rod ends are solid and non-serviceable. Durability of steering tie-rod ends depends on the condition of protective couplings, so the couplings damaged during the operation must be replaced. When a significant play occurs in the tie-rod end joints they shall be replaced.

I.1.2.2 Steering system maintenance

I.1.2.2.1 The steering system maintenance consists in regular inspection of the steering gear fastening, the piping, the free travel of the steering wheel as well as in servicing the hydraulic system assemblies. Such units as pump and steering gear shall be repaired in specialized service centers.

I.1.2.2.2 Steering hydraulic system oil change:

1. Warm the oil in the hydraulic steering system up to at least plus 20°C.
 2. Lift up the front part of the truck so that the wheels have no contact with the ground or place the truck front wheels onto the turning circles.
 3. Disconnect the drain pipe from the tank having placed the reservoir for the drained oil first.
 - 4. Start the engine for 10 sec max to have the oil flowed out of the oil tank and the pump.**
 5. Stop the engine and turn the steering wheel to the right and to the left several times to remove the rest of the oil.
 6. Clean the tank from the outside. Remove the old filter; replace it with the new one. Connect and fasten all hydraulic connections prior to the refilling the system with the oil.
 7. Pour the oil into the tank a bit lower than the upper mark of the filler plug gage.
 8. Start the engine for 5 sec max; then add oil. Continue adding oil preventing air coming into the hydraulic system due to the oil level lowering during bleeding.
 9. When oil reaches the upper mark on the gage; turn the steering wheel to both sides several times until there are no air bubbles in the tank. Add oil if need be.
- Check the oil level with unscrewed plug of the filler neck.

I.1.2.2.3 Adjustment of the steering gear valves actuation.

Check and adjust the steering gear limiting valves actuation (if required) upon the replacement of drop arm or drop arm rod or steering gear.

I.1.2.2.3.1 Operation description

Operation shall be done on an equipped truck placed over the inspection pit, on the horizontal hard and even bearing surface. It is recommended to place a turning table or two metal sheets with grease between them under each wheel.

Before starting work it is necessary to fill the hydraulic system with oil and bleed the air. To adjust hydraulic limiter of the pressure in the steering gear at max turning angles if steerable wheels it is necessary to do the following with shut-down engine:

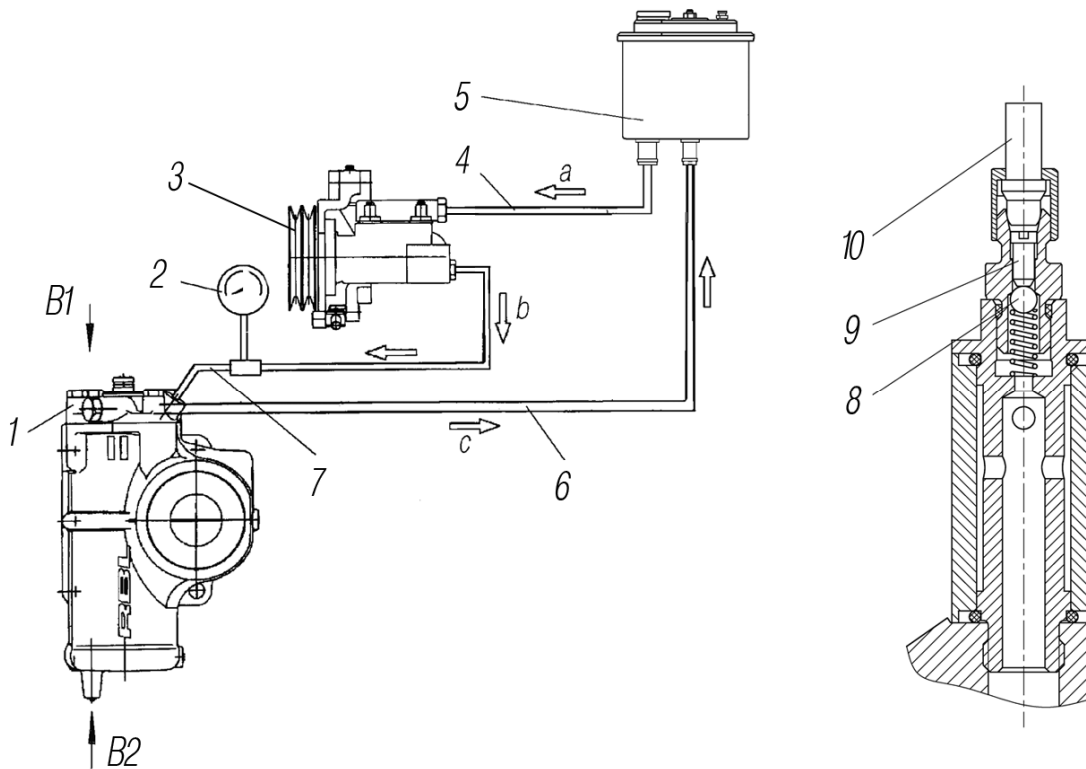
- remove plugs 2 & 8, Fig. I.6;
- unscrew the adjusting screws 3 & 7 by 3-5 turns with a screwdriver without considerable effort;
- connect pressure gage to the outlet on the high pressure turning elbow in the steering gear having removed the plug from the connector first.

Measure the pressure in the hydraulic system with steerable wheels turned to the extreme position with the turn limiter thrusting against a pad. Check pressure always at rated engine crankshaft speed (starting from appr. 1200 rpm).

Caution! Effort applied to the steering wheel at all stages of the adjustment shall be 100N (10kgf) maximum. It is not recommended to hold the steering wheel at the extreme position more than 5 sec.

Do the following for the left and for the right steerable wheel:

- at wheel turn limiting stops contact, obtain the pressure drop down to 75-85 kgf/cm² by alternate turning the screws B1 and B2 in, as shown in Figure I.8.



1-steering gear; 2-pressure gage; 3-pump; 4-suction pipe; 5-oil tank; 6-drain pipe; 7-delivery pipeline; 8-ball valve; 9-lifter; 10-plug; B1-adjusting screw for pressure limiting when turning left; B2- adjusting screw for pressure limiting when turning right

Fig. I.8 – Hydraulic diagram of steering gear valves adjustment check

Take into account that it is necessary to turn the adjusting screws in if the pressure drop is insufficient and to turn the adjusting screws out if the pressure drop is excessive during the adjustment.

Caution! Screw the adjusting screws with the rotary valve in its neutral position (released steering wheel) and engine running idle.

Set all removed plugs in place upon finishing the work.

I.1.3 Brake systems

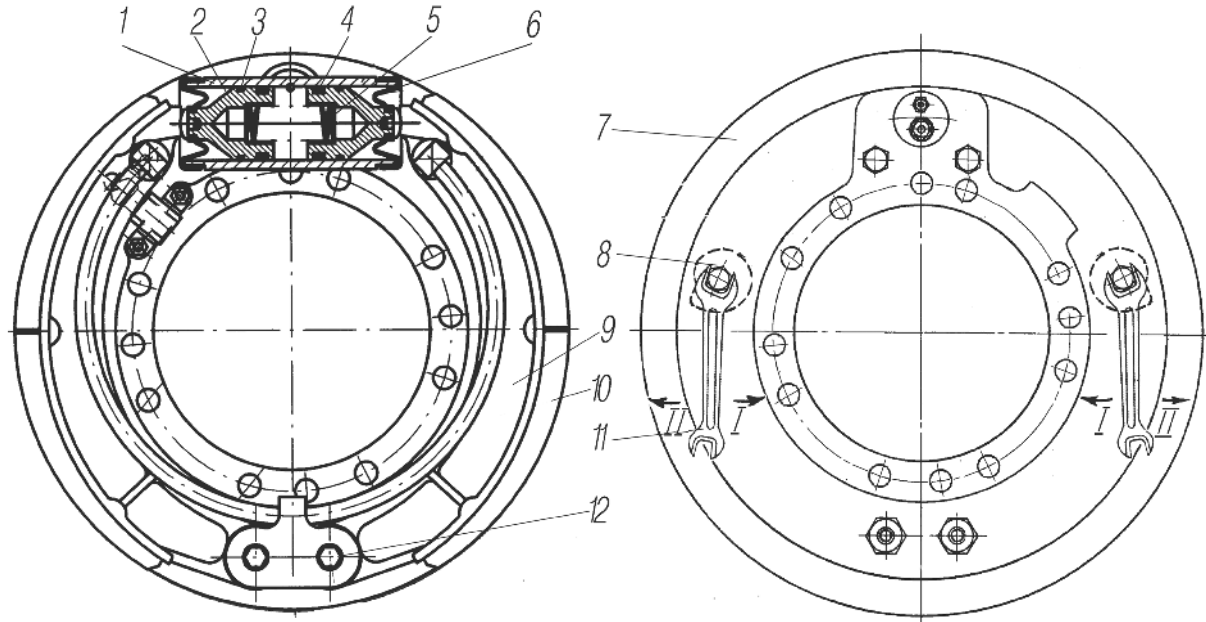
I.1.3.1 Service brake system consists of brake, air-hydraulic control system, air preparation system.

The service brake system is intended for the truck deceleration and stop. The brake drive is mixed (air-hydraulic), two-circuit or three-circuit, with the split braking.

I.1.3.1.1 Wheel brake mechanism (shown in Fig. I.9) is drum-type with the internal brake shoes 9 replaceable for each wheel. Each brake unit has a hydraulic cylinder. The brake shoes are mounted on the bearing axis 12.

I.1.3.1.2 Simplified adjustment of service brakes

Brake unit is adjusted upon the linings wear by reducing the clearance between the lining and the drum using adjusting cam gears 8.



1-wheel cylinder; 2-cylinder piston; 3-ring; 4-sleeve; 5-spring; 6-protective cover; 7-brake support; 8-adjusting cam gear; 9-brake shoe; 10-brake shoe lining; 11-wrench; 12-brake shoe pin; I-clearance decrease; II-clearance increase

Fig. I.9 - Service brake unit with the single-lane cylinder

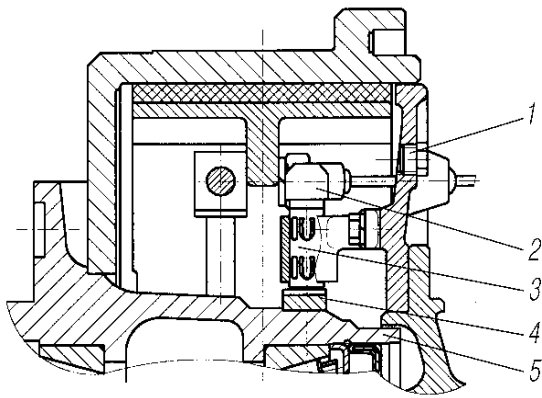
The brake adjusting order:

- using the wrench of 22 mm turn the adjusting cam gears against the stop. Turn the right (on the side of the support) clockwise, and the left one anticlockwise;
- loosen the cams by turning them backwards by 30° which corresponds to the cam axis end half turn.

Having followed the above-mentioned steps for all wheels; check whether the brake drums run hot during driving.

I.1.3.1.3 Speed sensor. Brake mechanisms of the front and of the rear wheels has inductive sensors 2 shown in Fig. I.10. In order to avoid damaging of the inductive sensor 2 it shall be recessed (from the center) by the brake drum before mounting. Then make it go till it thrusts against the impulse ring without excessive effort.

Inductive sensor 2 consists of a permanent magnet with a round rod and a coil. The rotational movement of the toothed impulse ring induces voltage pulses in the sensor's; pulse's frequency is proportional to the wheel rotation speed. The sensor is mounted in a special bushing



1-plug; 2-inductive sensor; 3-locking bush; 4-toothed impulse ring; 5-wheel hub

Fig. I.10 – Speed sensor

Angular velocity sensors of individual type mounted in the wheels of front and rear axles operating with the toothed impulse ring which is pressed onto the hub 5 are used for continuous read of the wheel speed. Received signal is transmitted to the control unit via cables. The gap between the rotor and the sensor should not exceed 0.7 mm for the normal operation of the sensor.

I.1.3.1.4 Service brake adjustment upon replacement of brake shoes or brake linings.

Adjust the clearances between the shoe and the drum using the brake shoe pins only while replacing the friction linings or the brake shoes.

Fix the brake shoe pins in the initial position of face-to-face marking. Insert the probe of 0.2 mm thick and 200 mm long into the gap in the brake drum between the drum and the shoe at 30 mm from the bottom of the shoe lining. By turning the pin 12 of the brake shoe (Fig. I.9) slightly clamp the probe. Remove the probe by turning the drum and with the help of another probe and the adjusting cam gear 8 set the clearance of 0.35 mm between the shoe and the drum at a distance of 30 mm from the upper edge of the lining. Fix the shoe pin and check the clearances between the shoe and the drum again.

Replace the linings when they are worn out to the rivet hand surface.

When the brake shoes are greasy rinse them with petrol.

If the brake drum is worn out and circular grooves are more than 2 mm deep, bore the drum working surface and locate the outer rings of the hub bearings off. The runout of the drum work surface should not exceed 0.25 mm, the drum diameter should not exceed 424.38 mm.

I.1.3.1.5 Combined (air-hydraulic) drive of service brakes (for truck with 6x6 wheel arrangement).

The truck is equipped with a three-circuit air hydraulic brake drive with additional braking valve, with double-wire trailer drive and ABS.

The compressed air from compressor 22 goes to air preparation unit consisting of oil separator 2, moisture-and-oil separator with the built-in pressure regulator 4, absorber receiver 3, shown in Fig. I.11. Passing through the unit the air is purified from moisture and oil; then the air is distributed to the circuits via four-circuit safety valve:

- the front axle circuit (the first circuit) consists of the air reservoir 8, the upper section of the brake valve 20, the air hydraulic booster and the wheel cylinders of the front axle;
- the circuit of the left and of the right wheels of the bogie consists of the air reservoir 6, the lower section of the brake valve 20, the air hydraulic boosters, the wheel cylinders of the left and right side of the rear bogie;

- the circuit of the parking brake and trailer drive consists of the air reservoir 7, return valve 9, brake valve with manual control 10, brake chamber of the parking brake 11, trailer valve 12, coupling heads 13.

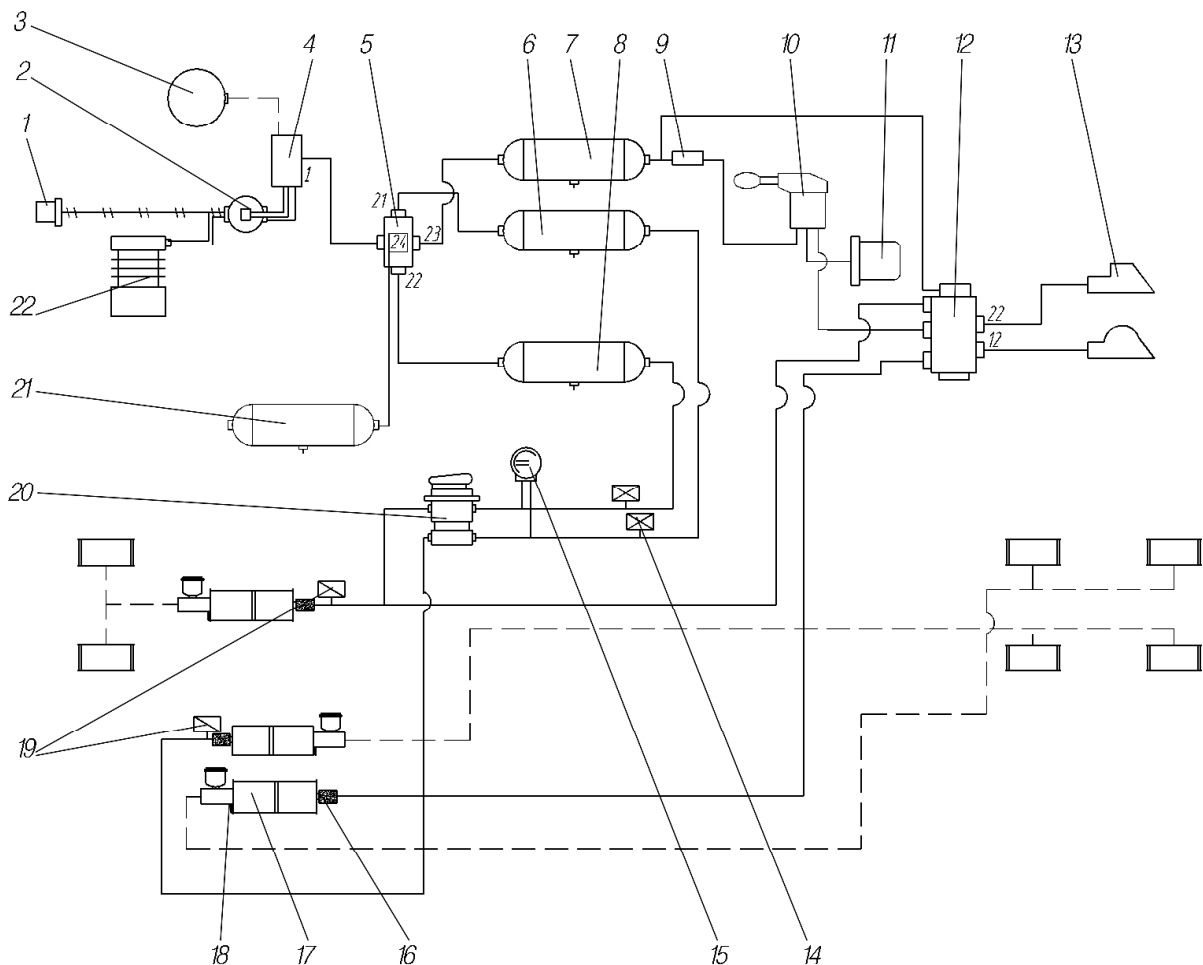
For system diagnostics in all circuits the control outlet valves are installed. For reservoirs servicing the moisture drain valves are provided.

If the truck is driven with the trailer the truck is connected with the trailer by means of the coupling heads 13.

By pressing the brake pedal the circuits of the truck brake drive as well as the circuit of the trailer brake drive are actuated.

If one of the circuits fails the other remains operative.

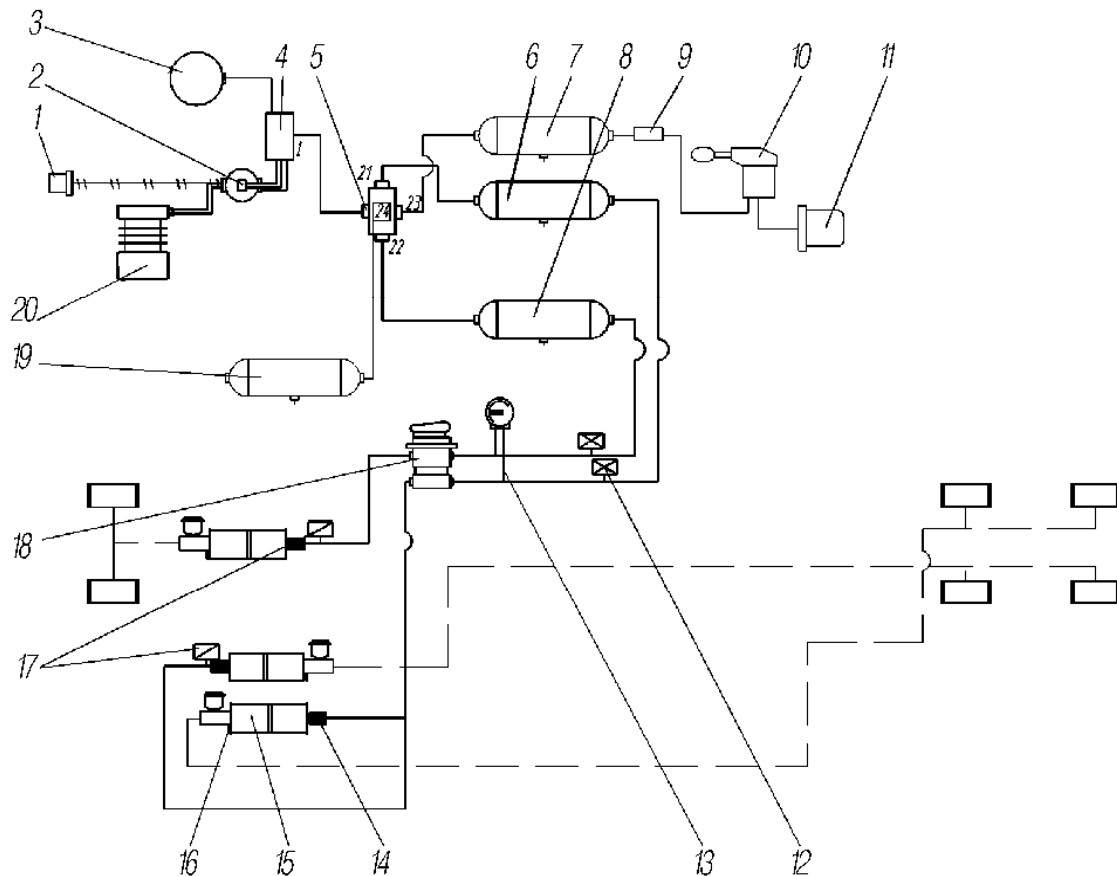
To park the truck with the trailer on the parking lot pull the parking brake lever in the upper fixed position: by that the control valve 10 delivers the compressed air from the valve 17 outlet and activates the brake mechanisms of the trailer.



1-towing unit; 2-oil separator; 3-absorber receiver; 4-oil and moisture separator with integrated governor; 5-four-circuit safety valve; 6-rear circuit brake receiver; 7-trailer receiver ресивер прицепа и CTC; 8-front axle brakes receiver; 9-return valve; 10-brake valve with manual control; 11-parking brake chamber; 12-trailer valve; 13-coupling heads; 14-pressure drop sensor; 15-two-pointer pressure gage; 16-ABS modulator; 17-brakes air-hydraulic booster; 18-brake failure sensor; 19-control outlet valve; 20-two-section brake valve; 21-receiver for non-brake consumers; 22-compressor

Fig. I.11 – Air hydraulic brake scheme

The scheme of the air-hydraulic brakes drive without outlets for the trailer is shown in Fig. I.12.



1-towing unit; 2-oil separator; 3-absorber receiver; 4-oil and moisture separator with integrated governor; 5-four-circuit safety valve; 6-rear circuit brake receiver; 7-trailer receiver ресивер прицепа и CTC; 8-front axle brakes receiver; 9-return valve; 10-brake valve with manual control; 11-parking brake chamber; 12-pressure drop sensor; 13-two-pointer pressure gage; 14-ABS modulator; 15-brakes air-hydraulic booster; 16-brake failure sensor; 17-control outlet valve; 18-two-section brake valve; 19-receiver for non-brake consumers; 20-compressor

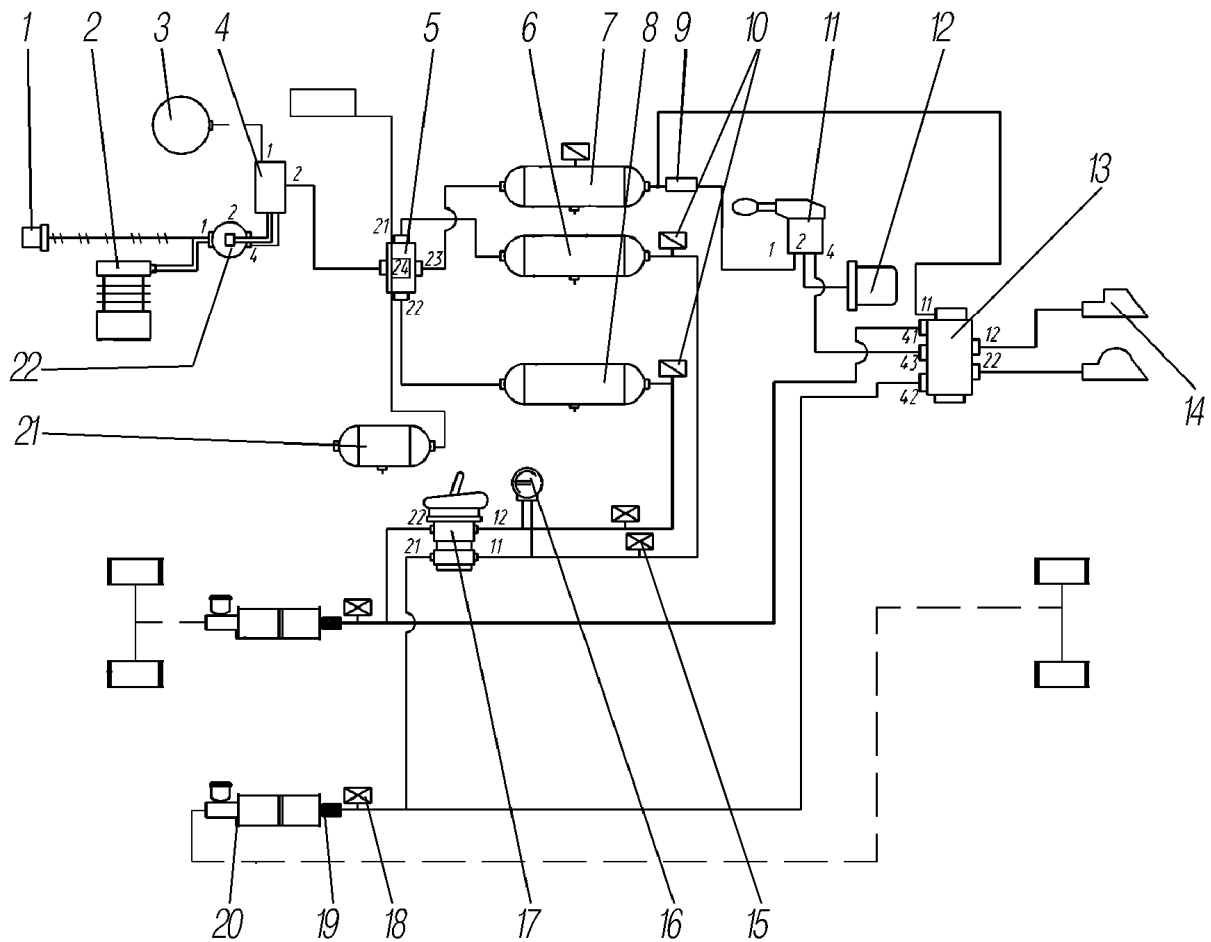
Fig. I.12 - The scheme of the air-hydraulic brakes drive without outlets for the trailer

I.1.3.1.6 Combined (air-hydraulic) drive of service brakes (for truck with 4x4 wheel arrangement).

The truck is equipped with a two-circuit brake drive coupled with a double-wire trailer drive.

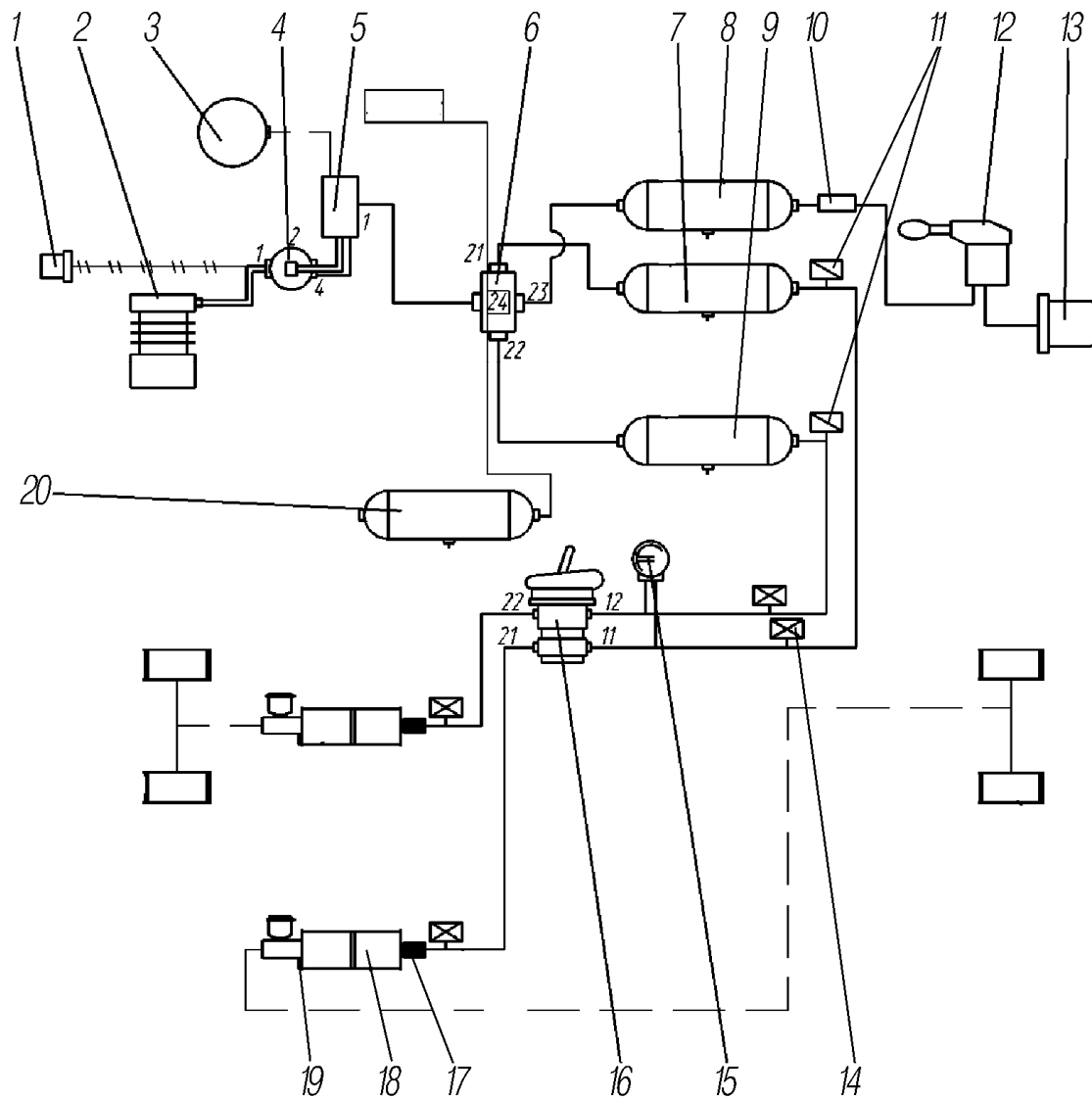
The basic scheme of the brake drive is shown in Fig. I.13.

The scheme of the air-hydraulic brakes drive without outlets for the trailer is shown in Fig. I.14.



1-towing unit; 2-compressor; 3-absorber receiver; 4-oil and moisture separator with integrated governor; 5-four-circuit safety valve; 6-rear circuit brake receiver; 7-trailer receiver ресивер прицепа и CTC; 8-front axle brakes receiver; 9-return valve; 10- pressure drop sensor brake; 11-valve with manual control; 12-parking brake chamber; 13-trailer valve; 14-coupling heads; 15-control outlet valve; 16-two-pointer pressure gage; 17-two-section brake valve; 18-ABS modulator; 19-brakes air-hydraulic booster; 20-brake failure sensor; 21-receiver for non-brake consumers; 22-compressor

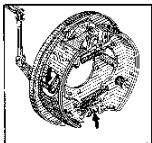
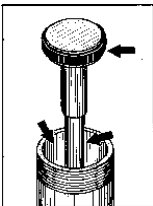
Fig. I.13 – Principal scheme of air hydraulic brake drive



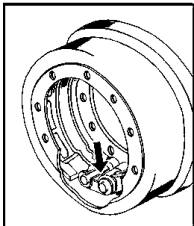
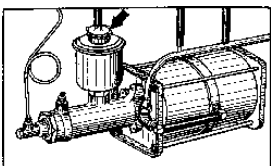
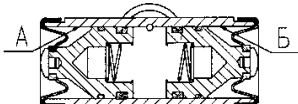
1-towing unit; 2-compressor; 3-absorber receiver; 4-oil separator; 5-oil and moisture separator with integrated governor; 6-four-circuit safety valve; 7-rear circuit brake receiver; 8-trailer receiver ресивер прицепа и CTC; 9-front axle brakes receiver; 10-return valve; 11-pressure drop sensor; 12-brake valve with manual control; 13-parking brake chamber; 14-control outlet valve; 15-two-pointer pressure gage; 16-two-section brake valve; 17-ABS modulator; 18-brakes air-hydraulic booster; 19-brake failure sensor; 20-receiver for non-brake consumers

Fig. I.14 - The scheme of the air-hydraulic brakes drive without outlets for the trailer

I.1.3.2 Fuels, Lubricants and Special Fluids

Pos. in Fig.	Designation of lubrication point or oil servicing of system	Quantity of Points	Main grades, application seasonality	Substitutes, application seasonality
1	2	3	4	5
-	Parking brake adjusting lever roller 	1	Engine oil	
-	Parking brake adjuster thread	1		
-	Hydraulic system of the steering: RBL C-700	1	Oil ВМГЗ	ГИПОЛ-РС
	Air cylinders of the auxiliary parking brake system 			
-	Air booster of the service brake system (rods, spacer collars, cylinders and collars of the pistons) 	2	Litol-24 grease	Grease 158

Foreign substitutes	Combustive-lubricating material quantity		Lubrication or change interval (combustive-lubricating material refill)		Lubrication recommendations (oil filling, charging or lubrication)
	Filling norm (l, kg)* ¹	Total per truck (l, kg)* ¹	Main grade	Substitute	
6	7	8	9	10	11
Shell Rotella X30, Rimula C 30 Mobil Delvak 1330, BP Vanellus M30 Shell RotellaX 20W-20, Rmula C 20W-20 Mobil Delvak 1320, BP Vanellus M 20W	7-10 drops	7-10 drops	M-(1500-3000) M-15 000		Clean the roller between the adjusting lever and the splash guard, lubricate.
	4-5 drops	4-5 drops	M-(1500-3000) M-15 000		Remove rubber plug on the brake support, lubricate
STATOIL TRANSWAY PS DX III	3,9	3,9	SM		Check the oil level in the booster pump tank, add if necessary
			M-(1500-3000) Every third M-15 000 At steering hydraulic booster repair		Change the oil (together with the filter replacement), check the oil level in the booster pump tank
AeroShell Grease 6	0,007	0,014	M-15 000		Change the grease. Lubricate the piston collars, rod, cylinder working surface
AeroShell Grease 6	0,03	0,06	-		Change the grease. Lubricate the piston collars, rod, cylinder working surface and spacer collar

1	2	3	4	5
-	Service brake shoe pins 	12	Graphite grease YCcA	Solid oil Ж, Solid oil C or grease Litol-24
-	Brakes hydraulic system 	3	Brake fluid «Томь» At a temperature below minus 40°C dissolve brake fluid with 18-20% of ethyl alcohol (by weight)	Brake fluid «Нева», «РОСДОТ» At a temperature below minus 40°C dissolve brake fluid with 18-20% of ethyl alcohol (by weight)
-	Service brakes main cylinders	3	Brake fluid «Томь»	Brake fluid «Нева», «РОСДОТ»
-	Service brakes wheel cylinders 	6	Brake fluid «Томь» Grease ДТ-1	Brake fluid «Нева», «РОСДОТ»

6	7	8	9	10	11
Rhodina EP2, Alvania HDX2, Mobilgrease Graphited №3	0,005	0,060	Every second M-15 000		Lubricate shoe pins and bushes
Shell Donax B, Mobil Hydraulic Brake Fluid, Gastrol Girling Pentosin Super Fluid I 1703-R	0,90	2,7 2,45 (4x4)	M-15 000		Check fluid level, if nec- essary add in tanks 15-20 mm below the upper edge of filler neck
			M-15 000		Replace the fluid (once every 5 years)
	0,150	0,45	-		Wash working surfaces of wheel and main cylin- ders with brake fluid
	0,05	0,30	M-15 000		Wash working surfaces of wheel and main cylin- ders with brake fluid
	0,02	0,12	-		Lubricate working sur- faces of the pistons at as- sembly and apply grease onto A & B surfaces

APPENDIX J
(recommended)

Table J.1 - List of collars mounted on the truck

№	Designation	Denomination	Mounting Place	Q-ty	Fig.	Pos.
Transfer box						
1	2,2-70x92-1 or PT 864176-02 or BDUM5SLX26	Collar	Front bearing cap of pri- mary shaft	2 1 1	32	3
	2,2-70x92-1 or PT 864176-02 or BDUM5SLX26	Collar	Bearing cap of front axle drive shaft	2 1 1	32	61
	2,2-70x92-1 or PT 864176-02 or BDUM5SLX26	Collar	Bearing cap of rear axle drive shaft	2 1 1	32	39
2	5323-1803226	Collar	Piston of the neutral gear Piston of gear shifting Piston of differential locking mechanism	2 1 1	51	9 10 54
Drive axles						
3	2.2-70x92-1 to- gether with 2.1- 70x92-4 or	Collar 2.2-70x92-1 State Standard 8752- 79/ Industrial Standard 38 05146-78	Rear bearing cap of front axle	1+1	40	11
	PT 864176-02 or	Collar 70x92-12x12 Technical Specification 2539-001-00232934- 2003		1	40	11
	BDUM5SLX26	Collar 70x92-13/18,5 «SIMRIT»		1	40	11
4	2.2-70x92-1 to- gether with 2.1- 70x92-4 or	Collar 2.2-70x92-1 State Standard 8752-79/ Industrial Standard 38 05146-78	Front bearing cap of the intermediate axle	1+1	40	11
	PT 864176-02 or	Collar 70x92-12x12 Technical Specification 2539-001-00232934- 2003		1	40	11
	BDUM5SLX26	Collar 70x92-13/18,5 «SIMRIT»		1	40	11

Table J1 Continuation

№	Designation	Denomination	Mounting Place	Q-ty	Fig.	Pos.
5	2.2-70x92-1 together with 2.1-70x92-4 or	Collar 2.2-70x92-1 State Standard 8752-79/ Industrial Standard 38 05146-78	Rear bearing cap of the intermediate axle	1+1	40	11
	PT 864176-02 or	Collar 70x92-12x12 Technical Specification 2539-001-00232934-2003		1	40	11
	BDUM5SLX26	Collar 70x92-13/18,5 «SIMRIT»		1	40	11
6	2.2-70x92-1 together with 2.1-70x92-4 or	Collar 2.2-70x92-1 State Standard 8752-79/ Industrial Standard 38 05146-78	Front bearing cap of the rear axle	1+1	40	11
	PT 864176-02 or	Collar 70x92-12x12 Technical Specification 2539-001-00232934-2003		1	40	11
	BDUM5SLX26	Collar 70x92-13/18,5 «SIMRIT»		1	40	11
7	375-4224017-03	Collar	Axle shaft housing	24 (16)*	41	1
8	4320-3104033-03	Collar	Wheel hub	6 (4)*	44	28
Truck suspension						
9	64221-2905338 or 50.2905070 or 50П.2905070	Rod gland	Shock absorber БАА3	1	49	4
		Rod gland	Shock absorber Г3АА	-	-	-
		Rod gland	Shock absorber ПАА3	-	-	-
10	1115-2918180	O-ring	Balancer hub	2	50	11
Power Take-off box with flange						
11	2.2-45x70-1	Collar 2.2-45x70-1 State Standard 8752-79/ Industrial Standard 38 05146-78	Bearing rear cap	1	128	17
Auxiliary Power Take-off box						
12	2.2-51x76-1	Collar 2.2-51x76-1 State Standard 8752-79/ Industrial Standard 38 05146-78	Bearing cap	1	129	13

Table J1 Ending

№	Designation	Denomination	Mounting Place	Q-ty	Fig.	Pos.
Winch (reduction gear)						
13	2.2-85x110-1	Collar 2.2-85x110-1	Winch shaft bearing left cap	1	130	37
14	2.1-45x70-1/3	Collar 2.1-45x70-1/3	Winch worm thrust bear- ing cap Winch worm shaft thrust bearing front cap	1 1	130	27
15	4320-4501127-01 (19x32x7)	Collar 4320-4501127-01 (19x32x7)	Hole in the winch reduc- tion gear housing for coupling fork rod outlet	1	130	19
* Values shown in brackets are for trucks with 4x4 wheel arrangement						

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Ural-5557-60 trucks and their modifications »
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