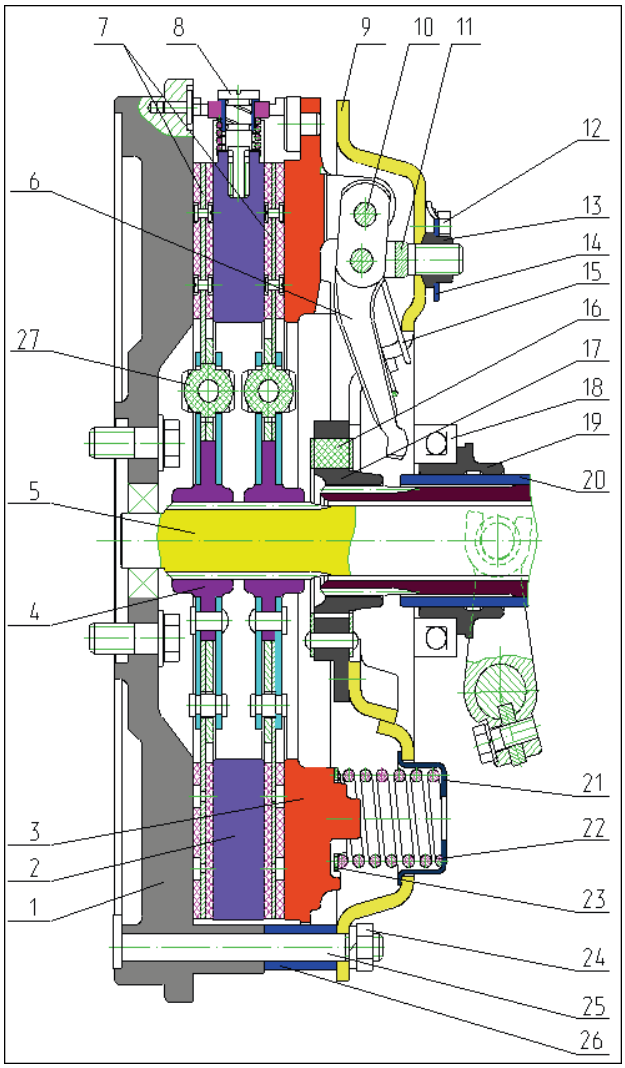
6. POSSIBLE FAILURES

6.1. POSSIBLE FAILURES OF COUPLING



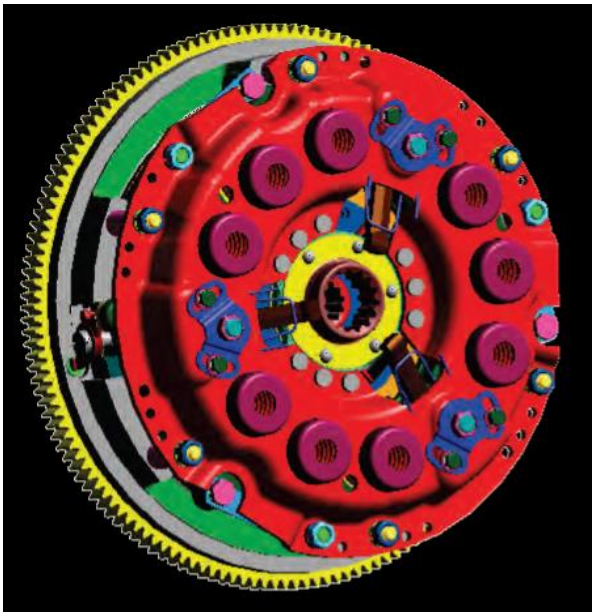


Fig. 6.1

1 – flywheel; 2 – center plate; 3 – pressure plate; 4 – hub of driven disc; 5 – power shaft; 6 – release lever; 7 – driven plates, 8 – leverage mechanism; 9- clutch cover plate; 10- lever axle; 11- yoke; 12- bolt; 13- adjusting nut; 14 –lock plate; 15- lever spring; 16- damper; 17- floating bushing;18- clutch release bearing; 19-clutch release yoke; 20- release yoke bracket; 21- cup; 22-compression spring; 23-insulating washer; 24- nut;
25- pin; 26-bushing; 27-driven disc damper.

Defect, external manifistation	Troubleshooting
Coupling slips	
There is no clearance between the shifter bearing and release levers. No free travel of the pedal).	Adjust the clearance
Oiling of driven disks linings	Reveal and eliminate the reason of oil penetration into the dry room. If necessary wash in petrol or change driven discs linings.
Linings of driven disks are worn-out.	Replace linings or assembled driven disks.
There is not enough tension of compression springs	Replace compression springs if tension increase 3 mm.
Clutch „grabs and shudders" (when putting into GB gear the clutch rattels)	
Increased pedal free travel	Adjust
Release levers are not in plane with release bearing.	Adjust
Increased runout (deformation) of driven disks.	Replace disks. Permissible runout 0,8 mm on the radius of 165 mm.
Jamming of driven disk hub on the splines of transmission shaft.	Clean and grease the splines. When the disks are worn out or jammed change the disks and transmission shaft.
Bearing in the flywheel is disrupted (power shaft suport)	Replace the bearing.

Possible failures of hydrostatic clutch drive and guidelines for troubleshooting

Dosing pump of hydrostatic power steering

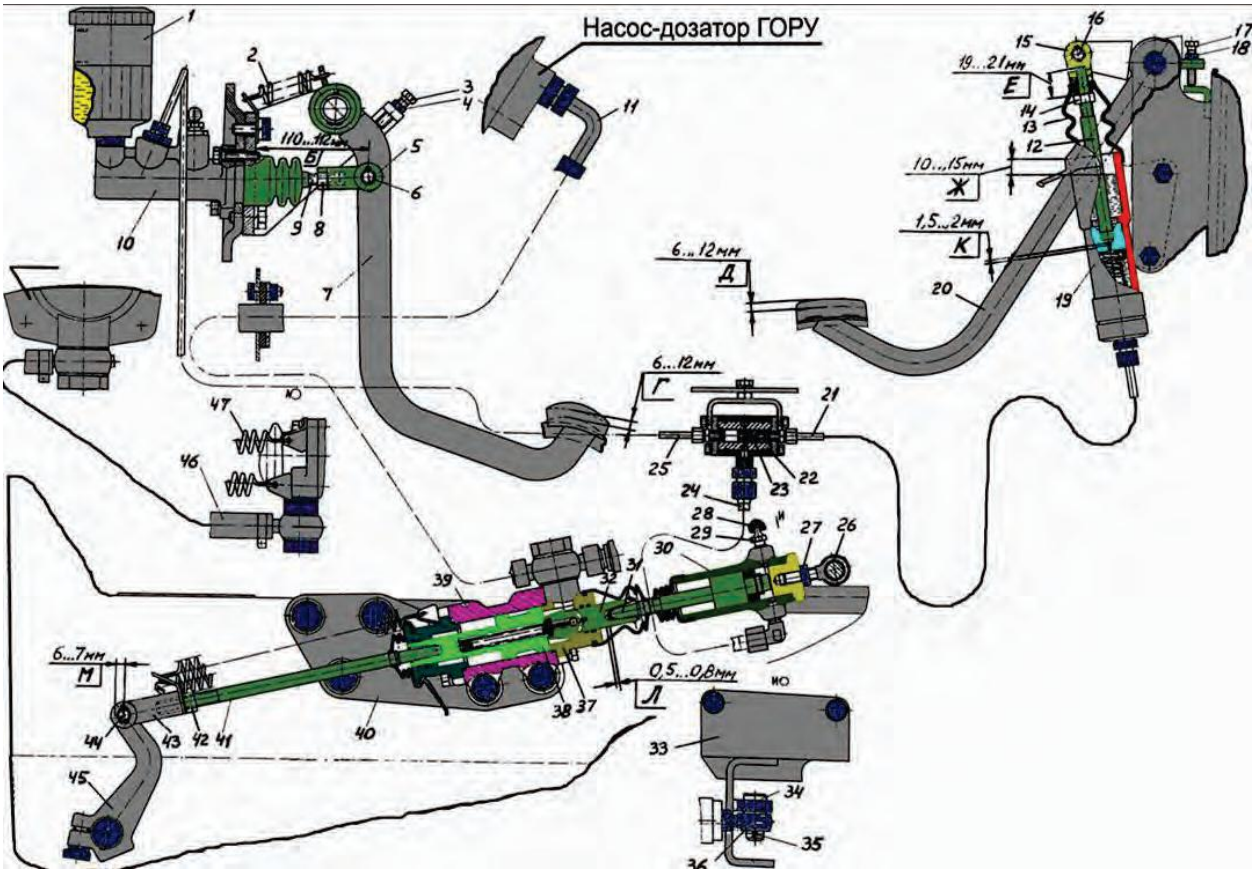


Fig. 6.2

1 -tank; 2- spring; 3, 17- bolt; 4, 8, 14, 18,27,42- nuts; 5, 15.43 - yoke; 6, 16. 34,44- pins; 7- clutch pedal for forward travel; . 12, 31,32 - pusher: 10 – main cylinder for forward travel; 11 – oil pipeline; 13 - cover; 19 – main cylinder for reverse; 20 – clutch pedal for reverse; 21. 25 - pipelines; 22 - valve; 23 - piston; 24 – flexible sleeve; 26 - support; 28 – protective cap; 29 – bzpass valve; 30 –working cylinder; 33,40 - bracket; 35 – splint pin: 36 - washer: 37 - cover: 38 - piston; 39 – hzdraulic booster; 41 - rod; 45 - lever; 46 – hose; 47 – backward spring.

Defect, external manifistation	Troubleshooting
Clutch coupling does not transmit full torque (“clutch skidding")	
Clearance space between clutch release bearing and release lever – “clutch is disengaged in a half” is nil (insufficient clutch-pedal clearance)	Adjust clearance
Partial engagement of clutch coupling (clutch lever does not return to initial position) when the clutch pedal is released, due to failure in clutch hydrostatic drive.	Detect and eliminate the cause
Clutch driven disk facing is worn out	Change driven disks
Clutch driven disk facings are oiled-up due to ingress of oil into dry section	Detect and eliminate the cause of oil ingress into dry compartment. If necessary wash in petrol or change driven discs linings.
Poor compression spring force (spring shrink due to continuous skidding and clutch overheating)	Change compression springs

Defect, external manifistation	Troubleshooting
Clutch coupling can not be fully disengaged (“clutch grabs and shudders”)	
Clearance space between clutch release bearing and release lever is increased	Adjust clearance
Clutch pedal free travel is increased	Adjust
Insufficient clutch lever stroke when the clutch pedal is fully depressed	Ensure full stroke of clutch lever and hydraulic amplifier piston stroke accordingly when the clutch pedal is fully depressed (not less than 24 mm).
Misalignment of release levers	Adjust position of release levers
Excessive warping of driven disks	Check face runout of driven disk facings against hub spline external diameter – shall not exceed 0,8 mm on 165 mm radius. If the failure can not be eliminated, replace the disks
Blocking of driven disk hub on transmission shaft splines.	Clean and grease the splines. When the disks are worn out or jammed change the disks and transmission shaft.
Damaged transmission shaft support bearing in flywheel	Replace the bearing

Defect, external manifistation	Troubleshooting
The clutch lever does not go back to the initial position when releasing clutch pedal	
Clearance between piston and piston pusher of main cylinder for forward travel and reverse is nil	Adjust
Clearance between operating cylinder pusher and hydraulic amplifier push rod is nil	Adjust
Sticking of main cylinder piston (does not go back in its initial position) due to piston cup and O-ring expansion, resulting in closure of compensating ports (in main cylinders of forward and reverse travel)	Use of incorrect hydraulic-brake fluid or ingress of mineral oil, petroleum, kerosene, diesel fuel into hydraulic-brake. Rinse hydraulic drive system with hydraulic-brake fluid. Replace damaged cups and O-ring in the main and operating cylinders. Replace hydraulic-brake fluid. Circulate hydraulic-brake fluid through the hydraulic system
Blocking of main cylinder piston due to piston cup expansion Blocking of valve piston due to O-ring expansion	
Hydraulic cylinder piston strokes are carried out with difficulty	Establish and eliminate the reasons for hard movement of hydraulic amplifier piston. Hydraulic amplifier piston starting and movement force shall not exceed 120 N
Hydraulic amplifier, operating cylinder and lever are out of alignment	Ensure alignment of hydraulic amplifier, operating cylinder and lever by shifting plate before tightening of bracket bolts
Clogging of compensating port in main cylinder for forward travel and reverse	Unclog the compensating port of main cylinder and deaerate the system
Loss of pullback spring power	Replace the spring

Defect, external manifistation	Troubleshooting
There is no full travel of clutch lever when pressing clutch pedal	
The play between the piston and piston pusher of main cylinder for forward travel and reverse is increased (increased free pedal travel)	Adjust.
The play between the pusher of working cylinder and pusher of hydraulic booster is increased.	Adjust.
Presence of air in hydraulic system of clutch control at forward travel and on reverse.	Bleed hydraulic system with brake fluid at forward travel and on reverse.
Insufficient level of brake fluid in the tank of hydraulic system at forward travel and on reverse.	Pour the brake fluid to the tank of the main cylinder up to the level at forward travel and on reverse. Bleed the hydraulic system with brake fluid at forward travel and on reverse.
Impermeability violation of work spaces of the main and operating cylinders because of damage, wear-out of cuffs or sealing ring.	Replace cuffs and a sealing ring in the main and operating cylinder. Make sure that there are no sharp edges, high spots or blisters on the face of the main and operating cylinders. Bleed the hydraulic system with brake fluid at forward travel and on reverse.
Bleeding of brake fluid in connections and pipelines in hydraulic drive system. Hydraulic system air leak.	Tighten the connections, replace damaged parts. Bleed the hydraulic system with brake fluid at forward travel and on reverse.

Defect, external manifistation	Troubleshooting
Clogging of hole in piston (on reverse), causing rarefaction in the main cylinder, from which air permeates into cylinder through sealings.	Clean the hole. Bleed the hydraulic system with brake fluid at forward travel and on reverse..
Plugging of hydraulic drive pipelines because of dent or clogging.	Replace pipelines. Bleed the hydraulic system with brake fluid at forward travel and on reverse.
Leak of oil through hydraulic booster sealing rings.	Replace sealing rings in hydraulic booster.
Insufficient clutch pedal travel (pedal striking cab wall)	With a help of yokes of main cylinders piston pushers and adjusting bolts extend clutch pedal full travel at forward travel and on reverse. Adjust clearance space between forward and reverse main cylinder piston and piston follower Circulate hydraulic-brake fluid through the hydraulic system. The stroke of forward and reverse main cylinders pushers shall be not less than 35 mm. The stroke of booster piston and of clutch engage lever when the pedal is fully depressed shall be not less than 24 mm.

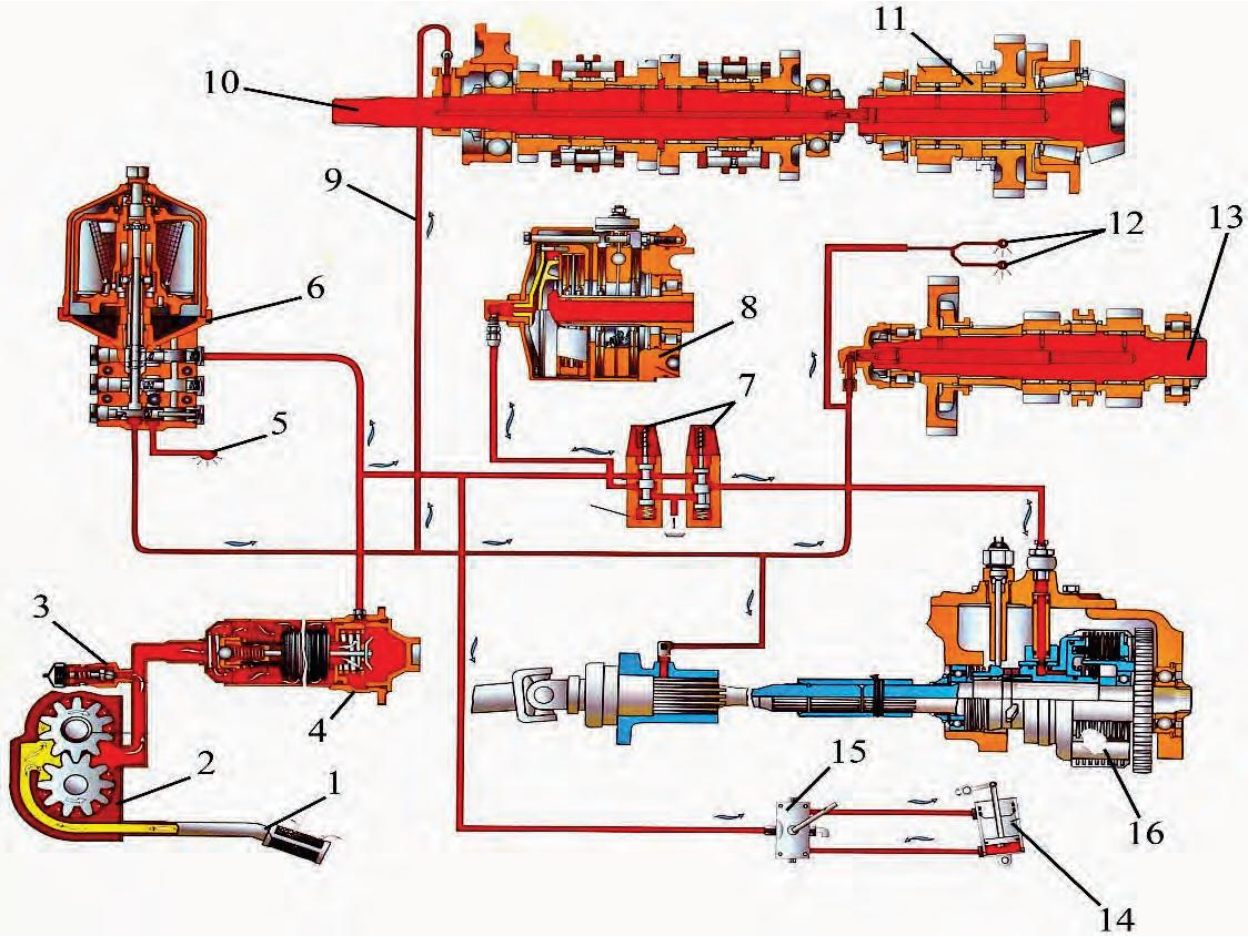
Defect, external manifistation	Troubleshooting

No pressure on clutch pedals on reverse.	Presence of air in hydraulic system. Cuffs and a ring in the main and operating cylinder are worn-out. Replace cuffs and a sealing ring in the main and operating cylinder. Make sure that there are no sharp edges, high spots or blisters on the face of the main and operating cylinders. Bleed the hydraulic system with brake fluid on reverse.
Misalignment of hydraulic booster, working cylinder and coupling lever	Achieve coaxiality of hydraulic booster, working cylinder and lever by means of moving of booster bracket and bracket of working cylinder support fastening before tightening of bolts.
Flexible hose increases in volume, blows up, elongates.	Replace flexible hose.
It is impossible to blow the system of hydraulic drive in reverse mode (BELARUS 1221B/1523B)	
Damage or worn-out of sealing ring of main cylinder rod of reverse.	Change the sealing. Blow the system.

6.2. POSSIBLE FAILURES IN GEARBOX AND GUIDELINES FOR TROUBLESHOOTING (Fig. 6.3)

Defect, external manifistation	Troubleshooting
Low pressure in hydraulic system	
Insufficient quantity of oil in transmission.	Add oil in case up to a label “П“ on glass of oil-gauge glass.
Pollution of screen filter of hydrosystem	Wash out filter.
High pressure in hydraulic system	
Sticking of valve for filter-distributor control.	Wash out valve of filter distributor.
The channels for oil drain in transmission are clogged.	Wash out drain channels.
No pressure in hydraulic system	
Hydraulic system pump drive is off	Switch on the pump
Insufficient quantity of oil in transmission	Add oil in case up to a label “П“ on glass of oil-gauge glass.
Increased noise during gear shifting	
Coupling clutch is not fully disengaged	Adjust coupling clutch
Wear of cone surfaces of synchronizers and gears	Change worn-out parts.

Defect, external manifistation	Troubleshooting
Increased noise	
Insufficient quantity of oil in transmission.	Add oil in case up to a label “П“ on glass of oil-gauge glass.
Wear and breakdown of bearings and other parts of transmission.	Change bearings and other elements.
“L or H” pass of GB reducing gear can not be engaged (GB 24F +12R)	
Maladjustment of sensor (switch) of gear shifting lever neutral position	Adjust the sensor with a help of shims. In neutral position of lever the electric circuit of electro-hydraulic distributor shall be closed.
Circuit opening of GB reducing gear shifting	Elimitate opening
Sticking or jamming of sleeve valve of electric-hydraulic distributor	Rinse valve spool. Replace valve if necessary



1.intake filter; 2. gear pump; 3. safety valve; 4. intake filter; 5. rear axle differential lubrication; 6. filter-distributor; 7. electrohydrodistributor; 8. coupling of rear axle differential lock; 9. channels for oil supply to the GB shafts; 10. GB input shaft; 11. transmission main shaft; 12. lubrication of rear axle planetary group; 13.GB low gears shaft; 14. hydraulic cylinder of PTO drive; 15. PTO control valve; 16. hydrocontrolled multiple-plate clutch of FDA drive.

6.3. POSSIBLE FAILURES IN REAR AXLE AND GUIDELINES FOR TROUBLESHOOTING

Defect, external manifistation	Troubleshooting
Increased noise of the main gear	
Improper adjustment of gears engagement of main gear according to through tooth-contact pattern and side clearance	- adjust of gears engagement of main gear according to through tooth-contact pattern; - adjust side clearance in engagement of main pair
Improper adjustment of conical bearings of main gear	Adjust bearing preload.
Not enough oil in transmission	Refill oil up to oil level mark
Gear teeth damage	Check the condition of gear tooth ring. There shall not be any chippage and damage. Gears with damaged teeth shall be replaced in pairs
The differential lockup does not function:	
Lock clutch disks are oiled.	Eliminate oil leakage, wash out discs.
The lockup clutch plate friction surfaces are worn out.	Change the plates.
The lockup clutch diaphragm is damaged.	Change the diaphragm.
Low pressure of oil fed into the lockup actuator.	Check the oil pressure applied to the lockup clutch. It shall be 9-10 kgf/cm^2 at the oil viscosity within 18...26 mm^2/s).
Lockup control electrohydraulic valve is inoperative.	Check safety fuses, relays and other circuit components for operability and the slide valve for easy and smooth travel; eliminate the fault.

Defect, external manifistation	Troubleshooting
Low pressure in the hydraulic system of the transmission	
Lack of oil in the transmission housing.	Add oil to the “П” (Full) mark.
Clogging of the hydraulic system screen.	Wash the screen.
Seizure of the overflow valve in the distributing filter.	Flush the distributing filter valve.
High pressure in the hydraulic system of the transmission	
Seizure of the overflow valve in the distributing filter.	Flush the distributing filter valve.
No pressure in the hydraulic system of the transmission	
The drive of the hydraulic system pump is OFF.	Turn the pump ON.
Lack of oil in the transmission housing.	Add oil to the “П” (Full) mark.
Excessive noise when shifting gears	
The clutch fails to disengage fully (the clutch “drags”).	Adjust the clutch.
The cone surfaces of the synchronizers and gear surfaces are worn-out.	Replace the worn-out parts.
Excessive noise:	
Lack of oil in the transmission housing.	Add oil to the “П” (Full) mark.
Bearings and/or other parts of the transmission are worn-out or broken.	Replace the bearings and/or other parts as necessary.

6.4 POSSIBLE FAILURES OF BRAKES AND GUIDELINES FOR TROUBLESHOOTING

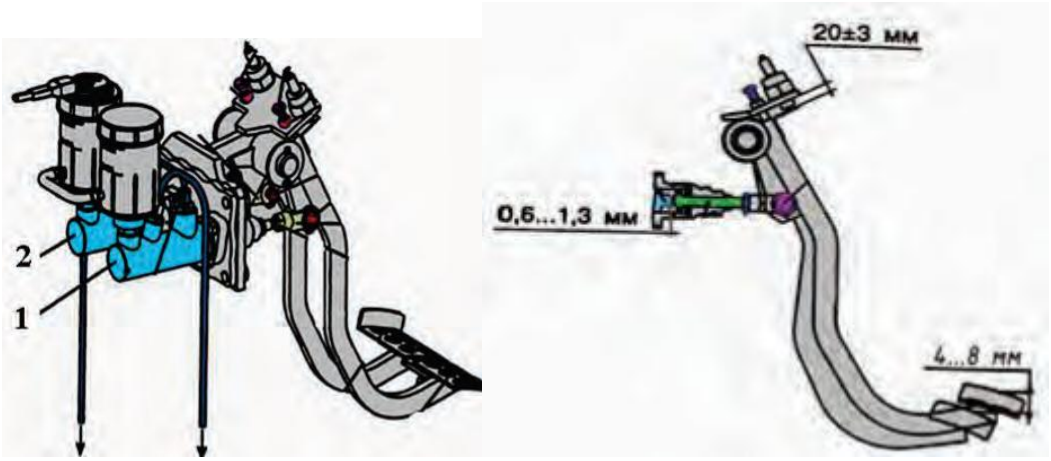


Fig. 6.4

Failure, external manifestation	Troubleshooting
Underperformance of brakes	
No free travel of pedals	Adjust pedal free travel in accordance with the Operation manual. Clean and rinse the cylinders 1 and 2. Bleed the system.
Swelling and seizing of cuffs of the main and service cylinders due to use of non-recommended or contaminated brake fluids.	Clean and rinse the cylinders 1 and 2. Replace the cuffs and the cylinders. Fill in clean cooling fluid.
Uneven braking of left and right wheels.	
Malfunctioning of leveling valves of main brake cylinders	Disconnect the leveling valve pipe, do the fittings out and dismount the leveling valves from the main cylinders. Replace the worn-out parts or the main cylinder assembly. Bleed the system.
Uneven breaking of rear wheels exceeds 0.5 m (acc. to the track)	Adjust the brakes.
Increased heating of breaks.	Check brake housings for presence of oil. If required top up the oil to the check plug level.

6.5.1 POSSIBLE FAILURES OF PTO WITH BAND BRAKES (fig. 6.5, 6.6)

Failure, external manifestation	Troubleshooting
Rear PTO does not transmit full torque or continues to turn when disengaged	
Maladjustment of PTO control mechanism (dimension Б>80 mm with PTO engaged and Б<32 mm with PTO disengaged).	Adjust the PTO control mechanism, to do this carry out **outer** adjustment of band brakes. If the recommended dimensions “Б” could not be obtained by means of this adjustment carry out **the inner** adjustment of brakes.
Wear of brake bands.	Replace the worn pats.
Wear or failure of PTO reduction group parts.	Replace the damaged parts.
With the PTO turned on the cylinder rod will not move. Low oil pressure in transmission hydraulics.	1. Shortage of oil in transmission hydraulics. Top up. 2. Contamination of hydraulics strainer. Rinse the strainer. 3. Sticking of an over-flow valve of the distributing filter. Wash the valve. **NOTE:** Define oil pressure value in the hydraulics with a pressure gauge (the scale shall be up to 1.5 MPa, the graduation mark - 0.05 to 0.1 MPa), screwing that instead of the threaded plug into the plate of the PTO actuator engaging electrohydraulic valve group. The oil pressure value shall not be lower than 0.9 +0.1 MPa.

Control hydraulics of rear PTO with band brakes

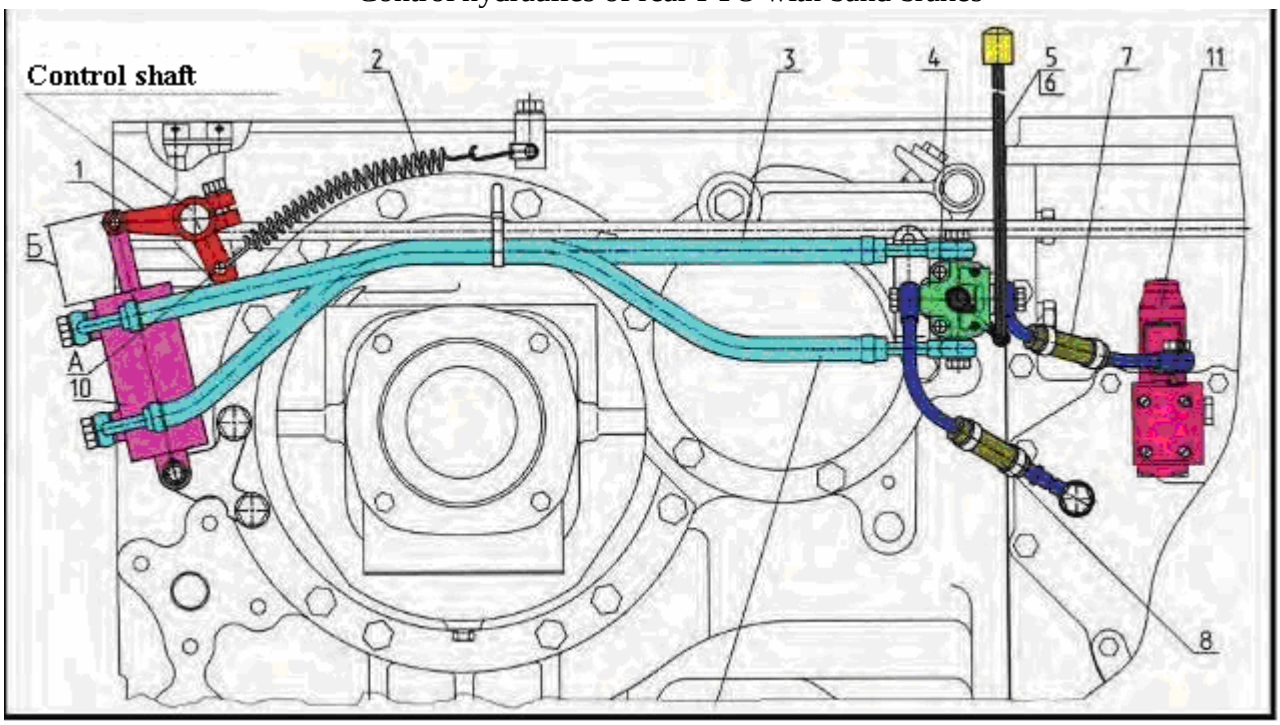


Figure 6.5

1 - lever; 2 - spring; 3 - pipeline; 4 – cock; 5 – link rod; 6 – handle; 7 – oil pipeline; 8 – oil pipeline; 9 – pipeline; 10 – cylinder; 11 – ADL electrovalve (for references)

The dimension “Б” in position “PTO on” shall make 66±3 mm and in position “PTO off” - 46±3 mm.

Adjustment of rear PTO with band brakes

Control shaft

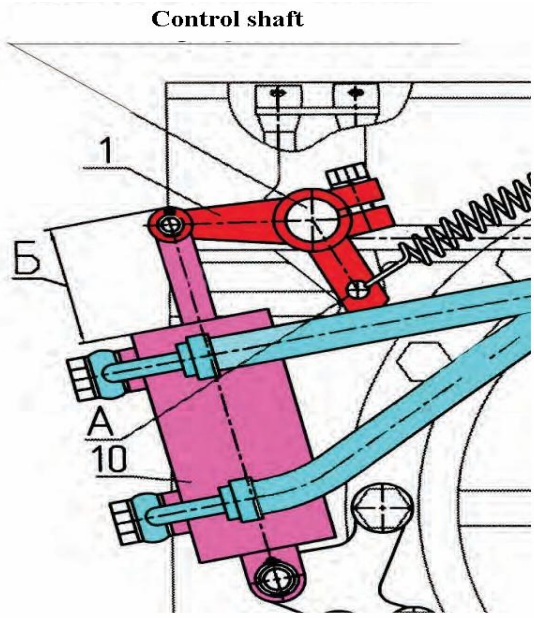


Figure 6.6

The external manifestation, pointing at the wear rate of brake band facings and the necessity of performing adjustment operations is the dimension “Б” between rod head top and the cap of the PTO actuation hydraulic cylinder. When the PTO is well-adjusted and unworn the dimension “Б” shall be as follows:

66±3 mm (PTO on);

46±3 mm (PTO off).

If the Б value is > 80 mm (PTO on) and Б value is < 32 mm (PTO off) and also in case of PTO skidding it is required to adjust the clearance in the band brakes

6.5.2 POSSIBLE FAILURES OF PTO EQUIPPED WITH PLANETARY GEAR GROUP WITH FRICTION PLATES

Failure, external manifestation	Troubleshooting
Failure of PTO control adjustment	Adjust the cable control of PTO.
Low pressure of oil in transmission hydraulics.	1. Shortage of oil in transmission hydraulics. Top up. 2. Contamination of strainer of transmission hydraulics. Rinse the strainer. 3. Sticking of the over-flow valve of the distributing filter. Rinse the valve. **NOTE:** Oil pressure value in the hydraulics with shall be measured with a pressure gauge (the scale shall be up to 1.5 MPa, the graduation mark - 0.05 to 0.1 MPa), screwing that instead of the threaded plug into the plate of the PTO actuator engaging electrohydraulic valve group. The oil pressure value shall not be lower than 0.9+0.1 MPa.
Low oil pressure at the outlet to the friction clutch and PTO brake due to: 1. Increased oil leakage in the valve group or in friction and in brake 2. Jamming of control valve spool.	Check oil pressure, delivered to the friction clutch and the brake. If required replace sealing rings of the friction clutch and the brake of the PTO gear group or the valve. Dismount the control valve. Clean and rinse the parts, eliminate the jamming causes. If required replace the faulty parts.
Fault in operation of friction clutch and brake because of piston jamming.	Rinse the parts of the friction clutch and the brake.
Wear of friction plates.	Replace the worn parts.

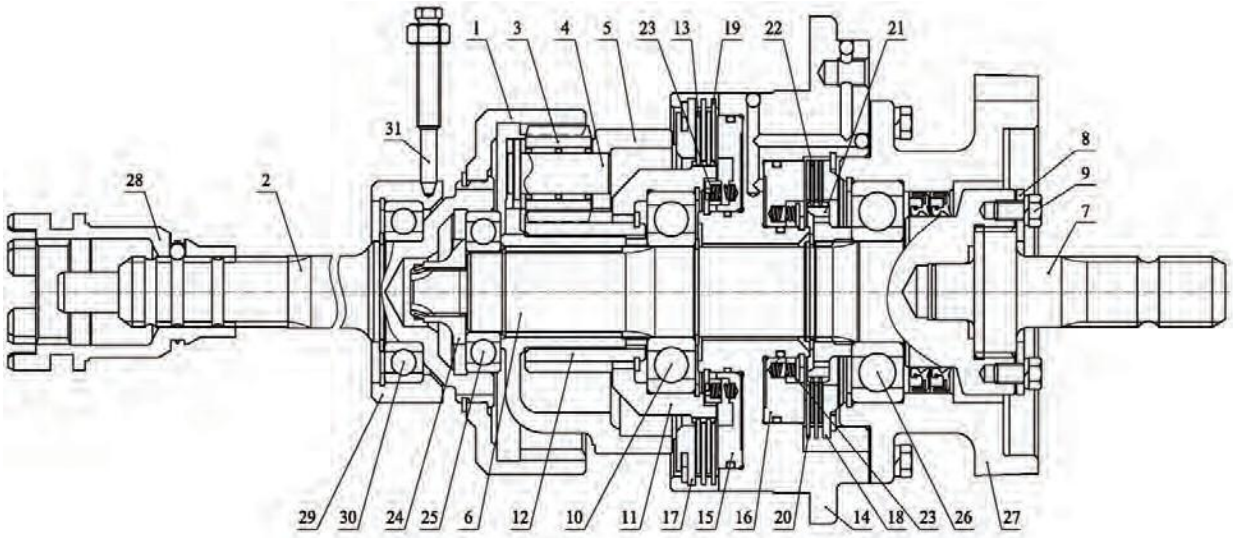


Figure 6.7

1 – crown gear; 2 – shaft; 3 – satellite gear; 4 – satellite gear shaft; 5 – carrier; 6 – shaft; 7 – exchangeable shaft end; 8 – plate; 9 – bolt M10x18; 10, 25, 26, 30 – bearing; 11, 21 – coupling; 12 – sun gear; 13, 22 – friction plate; 14 – casing; 15, 16 – piston; 17, 18 – thrust disk; 19 – driving plate; 20 – pressure plate; 23 – spring; 24 – nut; 27 – cover 28 – shift collar; 29 – cage; 31 – screw.

IT IS NOT REQUIRED TO ADJUST THE PTO GEAR GROUP!
THE PTO EQUIPPED WITH BAND BRAKES CAN BE REPLACED WITH THE PTO EQUIPPED WITH DISK BRAKES ONLY TOGETHER WITH CORRESPONDING REPLACEMENT OF REAR AXLE HOUSING.

Control of planetary gear group of rear PTO with friction plates (fig. 6.8)

The rear PTO does not transfer a full torque or continues to turn when disengaged	
Low pressure in transmission hydraulics	eliminate the cause
Friction plates worn-out	replace the plates
Failure of seals in service pistons of PTO gear group	replace rubber seals
Oil leakage out of seals of PTO gear group and PTO control valve	replace the seals

Attention: there is no need to adjust the gear group with friction plates during the whole service life of the tractor!

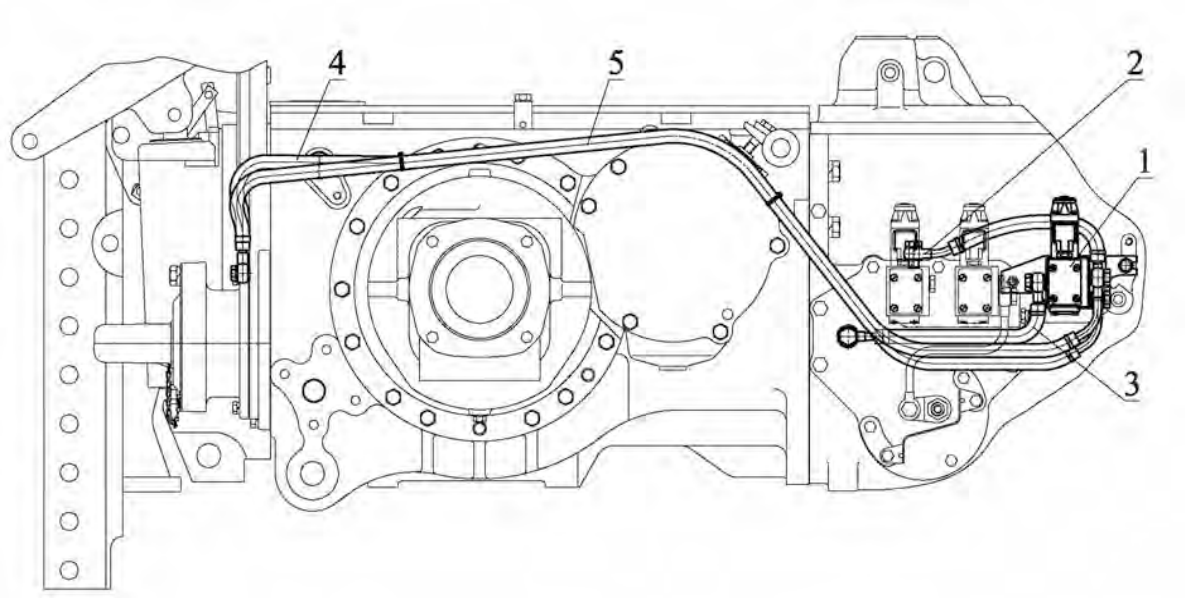


Figure 6.8

1-distributor; 2-oil takeoff pipeline; 3-drain pipeline; 4-pipeline of service brake control; 5-pipeline of parking brake control

To prevent impact loads on the PTO reduce the engine speed to 900 rpm with the PTO engaged, then increase the engine speed. To reduce load on PTO parts, reduce the PTO speed at first by reducing the engine rpm before turning the PTO off. This is primarily important for the implements with big inertia moment. Such implements shall always be equipped with a free-wheel clutch.

Three PTO shaft ends are provided for. When operating the 6 or 8-splined shaft end set the engine speed to 2037 rpm in order to obtain the standard PTO speed of 540 rpm.

6.6 POSSIBLE FAILURES OF FDA

Symptoms and causes of failure	Remedy
As tractor moves with the wheels turned against the stop there is noise in the gear group.	Check the PTO actuation mode (it stay in “Off” or “Automatic” position) Check the critical turning angle of the wheels. If required adjust it to stay within 38 to 40°.
Noise and heating in the main gear area.	Check the pinion and the gear for axial play. If required adjust the gear bearings to have a preload of 0.01 to 0.10 mm, and the pinion bearings to have a preload of 0.02 to 0.05 mm. Check the value and the location of the contact point. Adjust it if necessary.
Knocks in steering axis during travel.	Check the pivot bearing adjustment. If required adjust the bearings to have a preload so that the force of turning of the gear group housing round the pivot axis, applied to the flange, made 60 to 80 N.
Knocks by sharp turn of the wheels.	Check attachment of the pins of the steering link and the swing hydraulic cylinder. If required eliminate the play.
Oil leakage through the gear group breather.	Check oil in the gear group. Drain the excessive oil. Do the breather out of the gear group casing and clean it out. Rinse or replace the supplementary foamed rubber filter.

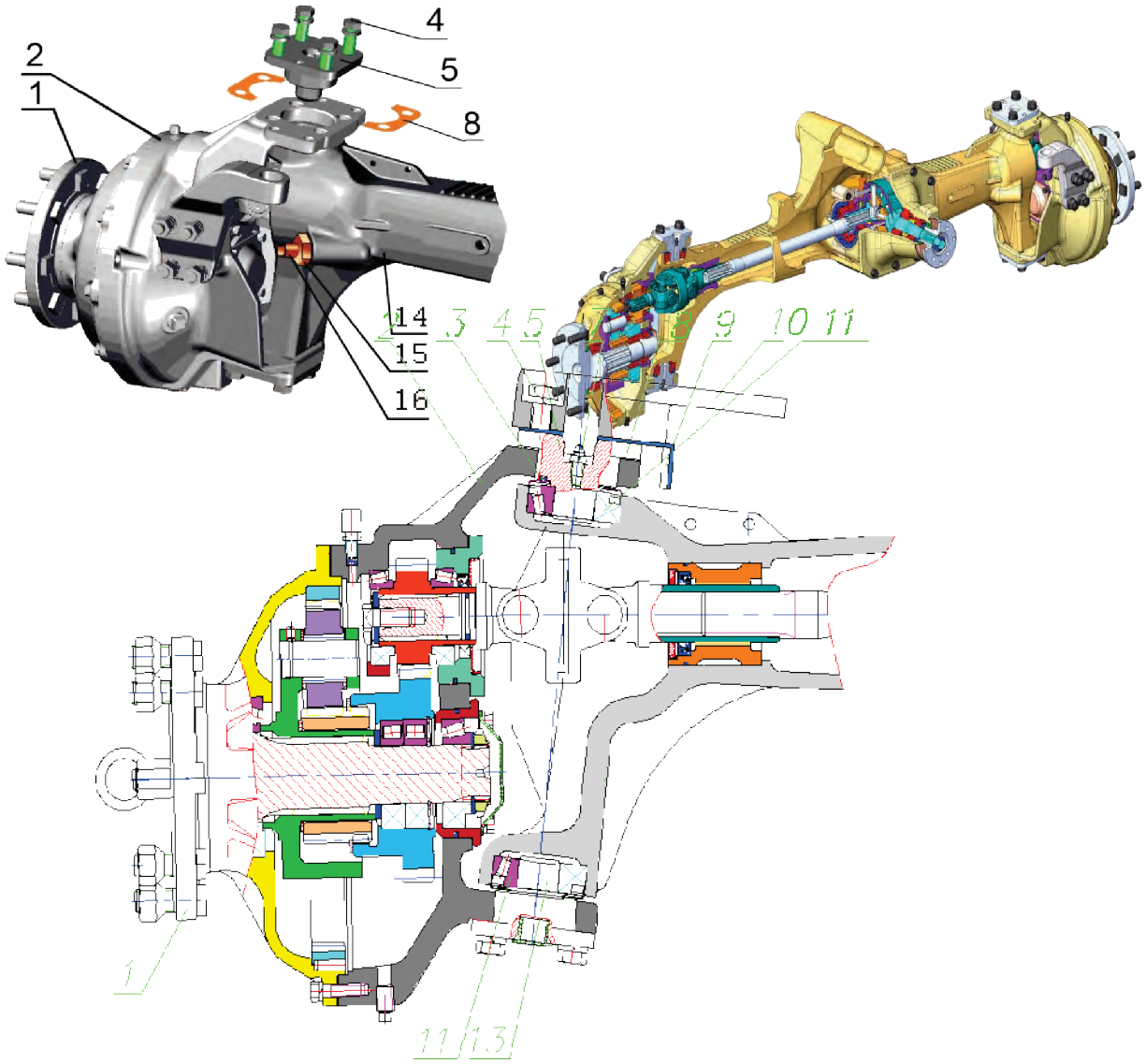
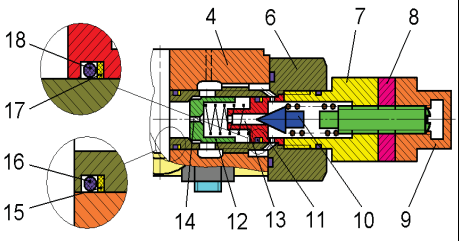
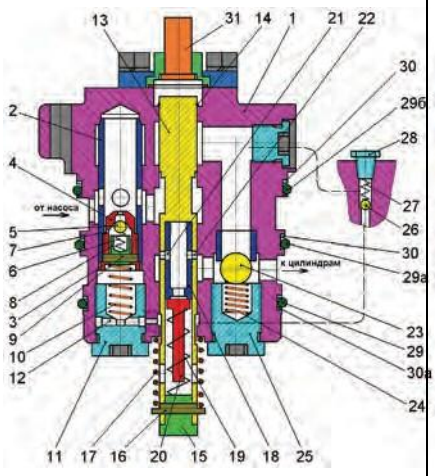


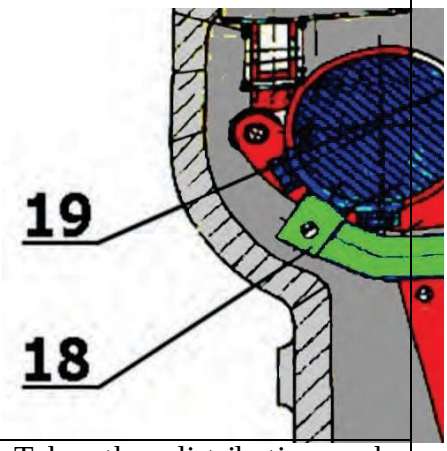
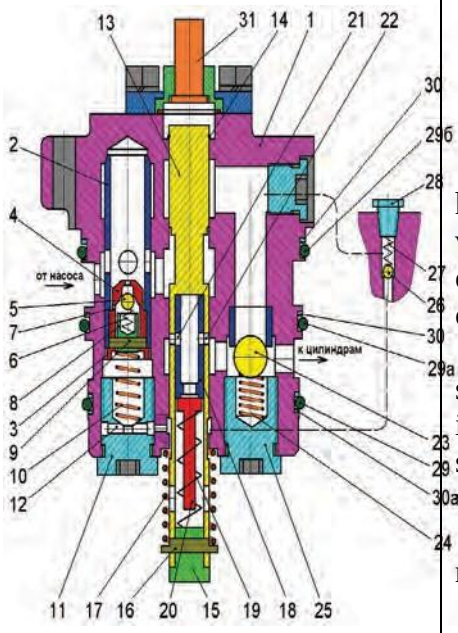
Figure 6.9

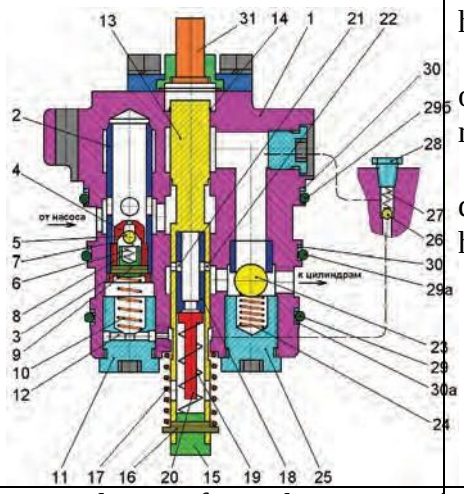
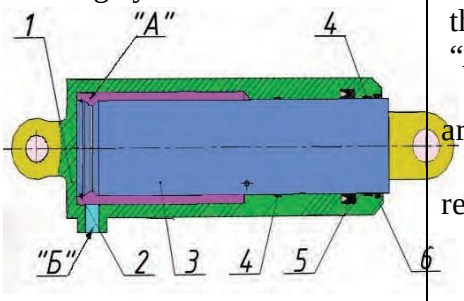
1-flange; 2-gear group;3-ring; 4-bolt M16x60 (8 pieces);
5-pivot upper axis; 7-grease cup; 8-divided gaskets;
9-bracket; 10-base; 11-taper roller bearing;
13-pivot lower axis; 14-FDA beam; 15-nut;
16-adjusting screw

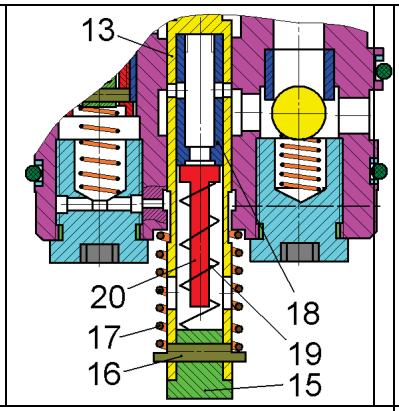
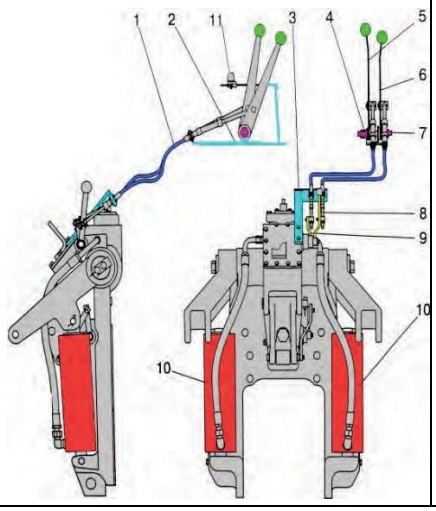
6.7 HYDRAULIC LIFT FAULT DIAGNOSTICS

Hydraulics failure	Failure cause	Failure repair procedure
1.No weighted hitch elevation or slow elevation.	Breakdown either of a pump, or the RP-70 valve group, or the distributing valve group.	Check the pressure and the volume pump rate under normal engine rpm. With pressure of 16.0 MPa, the volume pump rate shall be at least 40…50 l/min. Renew the pump, if required. If the pump is without fail, check the volume pump rate under the same conditions for one of the outputs of the RP-70 section valve group. If the distributor is without fail, the difference in volume pump rate shall be no more than 3…3.5 l/min. If during examination the pressure is unstable or the volume pump rate loss is more than 3.5 l/min, the fault is because of RP-70 valve group.
2. No weighted hitch elevation or hitch lifting power fall-off because of RP-70 valve group (or RS-213 "Mita") fault.	a) blocking of spray nozzle 14 in plunger 12 of the blow-off valve of the RP-70 valve group; b) sticking of plunger 12 of the blow-off valve; c) seal failure of needle 10 of the blow-off valve because of particulate matter in oil; d) damage of rubber joint 18 or fluoroplastic joint 17 of seating 11; e) damage of rubber joint 16 or fluoroplastic joint 15 of the blow-off valve.	a), b), c) – screw out the fitting 7 of the blow-off valve from casing 6 of cover 4 of the RP-70 valve group and, without disturbing the control settings (that is, without turning back cover nut 9 or lock nut 8) demount the blow-off valve to pieces and wash the pieces thoroughly. Check spray nozzle 14 flotation in plunger 12; d), e) – renew the damaged rubber joints 16 & 18 or fluoroplastic joints 15, 17. After having reassembled the system, place back the offloaded pieces of the blow-off valve and check the hydraulics performance. 

		Blow-off valve of the RP-70 valve group.
3. No weighted hitch elevation or hitch lifting power fall-off because of valve group control fault.	a) sticking of control spool 13 in casing 1 because of particulate matter in oil; b) sticking of relief valve 2 abroach; c) clogging of spray nozzle 7 of isolation valve 3; d) damage of rubber 29, 29a, or 29б or fluoroplastic 30 or 30a gaskets on casing 1.  	a) set both levers of the valve group control (position and draft control levers) to forward most position and lower the hitch to lowermost position. Press the push rod 31 in order to sink it in the upper cover and measure the push rod 31 protrusion above the cover. Set the position lever to the rearmost position and measure the push rod 31 protrusion again. The difference in indications shall be at least 7 mm. If the push rod travel is 7 mm and more, the spool 13 of the valve group control is without fail. If the push rod travel is less than 7 mm, the valve group control shall be dismounted, its pieces shall be washed thoroughly, and, if required (should there be any scuffs), the spool 13 shall be reseated in the casing bore. b), c) – dismount the valve group control. Unscrew plug 11, remove relief valve 2, and wash the valve and its seating in casing 1 with diesel fuel. Screw out isolation valve 3 from the relief valve 2 and check spray nozzle 7 flotation. When reassembling the system, screw the isolation valve 3 with glue into the relief valve 2. d) renew the damaged rubber 29, 29a, or 29б or fluoroplastic 30 or 30a gaskets of the valve group control casing. After having reassembled the system, install the valve group control into the hydraulic lift casing and check the performance.
4. The pump will not unload after the uplift completion in transport position of the linkage.	The position of the swing levers with regard to the limit stop 19 of the position sensor 18 is disturbed.	Detach the lifting rods of the linkage from the swing levers of the hydraulic hoist. Do the bolts on the turn shaft ends out.

After the uplift is completed there comes a distinctive noise from the pump, running the max. pressure, the failure becomes apparent only with the linkage fully uplifted (the pump will unload as the uplift is incomplete)		Take the swing levers off the splines and displace them by one spline down to the cylinder direction. Lock the swing levers on the shaft with the plates, doing the bolts in. 
5. Increased oil temperature (above 80ºC) in the tank. The pump is constantly running under the load (the pressure above 20 MPa) with the linkage uplifted with the implement. As the position handle is shifted forward to the first lowering the pump will not unload. Inner tightness is ok – with the engine killed (or the pump off) the linkage with the implement having the weight of not less than 800 kg will lower from the transport position (cylinder shrinking) by not more than 25 mm in 5 min.	a) Fracture or shrinkage of spring 6 of isolation valve 3. Seal failure of ball 5 of the isolation valve 3; b) seal failure of ball 26 of the counterbalance valve. 	Take the distributing valve group off the hydraulic hoist; a) screw the plug 11 out and remove the discharge valve 2; Screw the isolation valve 3 out of the discharge valve 2 and disassemble it. Measure a length of the spring 6. Should the spring length be less than 12 mm or should it be deformed, replace the spring. Throw the ball into the housing 4, put the housing in the vertical position and check tightness of the ball filling in fuel. Herewith close the side jet orifice 7. If the fuel level drops significantly within 2 to 3 minutes, impress the ball in the seating 5 by slight thrusts of the hammer on the workholder. Assemble the valve group and mount it into the hydraulic hoist. b) screw the taper plug 28 out. Take the spring 27 out as well as the ball 26 of the counterbalancing valve. Rinse the spring 27, the ball 26 and the seating in the housing with diesel fuel. Impress the ball (through the workholder) to the seating in the housing.

		Assemble and mount the distributing valve group into the hydraulic hoist.
6. Increased oil temperature (above 80ºC) in the tank. The pump is constantly running under the load (the pressure above 20 MPa) As the position handle is shifted forward the pump will unload for a short time. Failure of inner tightness (with the engine killed or with the pump off the linkage with the implement will lower)	a) fracture of rubber seal rings 29, 29a, 29б in the outer grooves of the casing 1 of the distributing valve group. Seal failure of ball 23 of the antishrinking valve; b) fracture of the rubber seal ring on the plug 25 of the antishrinking valve. 	Take the distributing valve group out of the hydraulic hoist; a) check the state of the rubber rings 29, 29a, 29б. If damaged replace them; b) unscrew the plug 25 of the antishrinking valve, take out the spring 24 and the ball 29, inspect the orifice surface in the seating, impress the ball 23 to the seating using the workholder in the housing. Check the state of the seal ring on the plug 25 and replace it if required. Assemble and mount the distributing valve group into the hydraulic hoist housing.
7. The weighted linkage goes down by itself with the engine killed (or with the pump turned off). “Often” correction. Oil heating is possible. Outer leakage of oil over the plunger of one or both cylinders.	Failure of gaskets 5 of actuating cylinders 	Take the plunger 3 out of the casing 1, having previously transferred the lock ring 2 to the mounting groove “A”. Replace the gasket 5 having arranged it as shown in the figure. Assemble the cylinder in a reverse order.
8. High vibration of the linkage when lowering the implement. May occur when heavy implements with 2000kg weight are lowered.	Fracture or shrinking of the spring 19 of the slowdown valve 18. Fracture of limit stop 20.	Take the distributing valve group off the hydraulic hoist; Squeeze the pull-back spring 17 to release the dowel 16 and take it out of the hole in the spool 13, hereby holding the outer limit stop 15.

			Measure the length of the spring 19. If the length is below 61 mm or the spring is deformed replace the spring. Should the limit stop 20 be deformed replace it. Assemble the distributing valve group in a reverse order.
9. The control handles (position and draft control) will not hold in a set position on the control panel. Self-shifting – slipping of one or both handles forward in the direction of linkage lowering.	The tightening is loosened or the friction washers securing the handles 5 and 6 are worn out.		Adjust the nuts 4 and 7 on the shaft of the bracket 2 by tightening the friction washers until the fault is eliminated.
10. Position of the control handles (position and draft control) on figures “0” and “9” will not correspond to transport and lowermost positions of the linkage. The cylinder plunger stroke is less than 190 mm	Failure of cable adjustment of handle position on control panel.		Adjust the control cables 1 (see points 8-21 above)

Hydraulic valve group RS-213 “Belarus” (HLL with draft control)

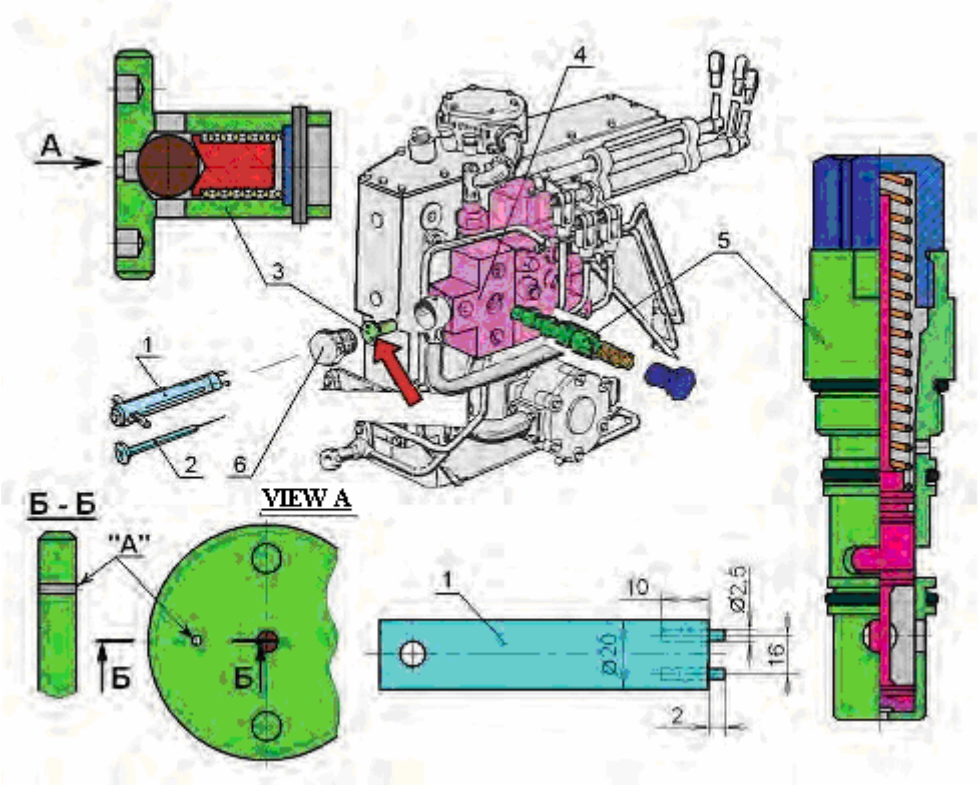


Figure 6.10

1 - special wrench; 2 – needle; 3 – acceleration valve; 4 - section valve group; 5 - bypass valve; 6 - bolt of the swivel angle.

The section valve group RS-213 «Belarus» 4 with bypass valve 5 of cartridge type is very sensitive to the pollution of oil in the hydraulics. Dirt in the hydraulic system can cause seizing of the bypass valve or clogging of throttle orifice «A» in the seat of the acceleration valve 3. This will lead to the opening of the bypass valve and oil will drain (the draft control system as well as the remote hydraulic cylinders will not operate).

Do the following to fix the problem:

1. Remove the left and the back panel of the instrument board cover;
2. Do the bolt 6 out of the swivel angle and the bypass valve 5 to have access to the acceleration valve 3.
3. With the help of the needle 2 clean the throttle orifice «A» (Ø 1,3…1,4 mm) of the acceleration valve; if necessary, unscrew the valve with the help of special wrench, rinse it in clean diesel oil and blow with compressed air, mount the valve in place;
4. Inspect the bypass valve 5 and make sure that the plunger moves easily. If necessary, pull down the valve, rinse the parts in clean diesel oil and attain the free movement of the plunger; assemble the valve;
5. Mount the bypass valve 5 and bolt 6 of the swivel angle in place;
6. Start the engine and check functioning of the hydraulic system;
7. Mount the panels of the instrument board cover in place.

6.8 ELECTRICS TROUBLESHOOTING

Power supply system

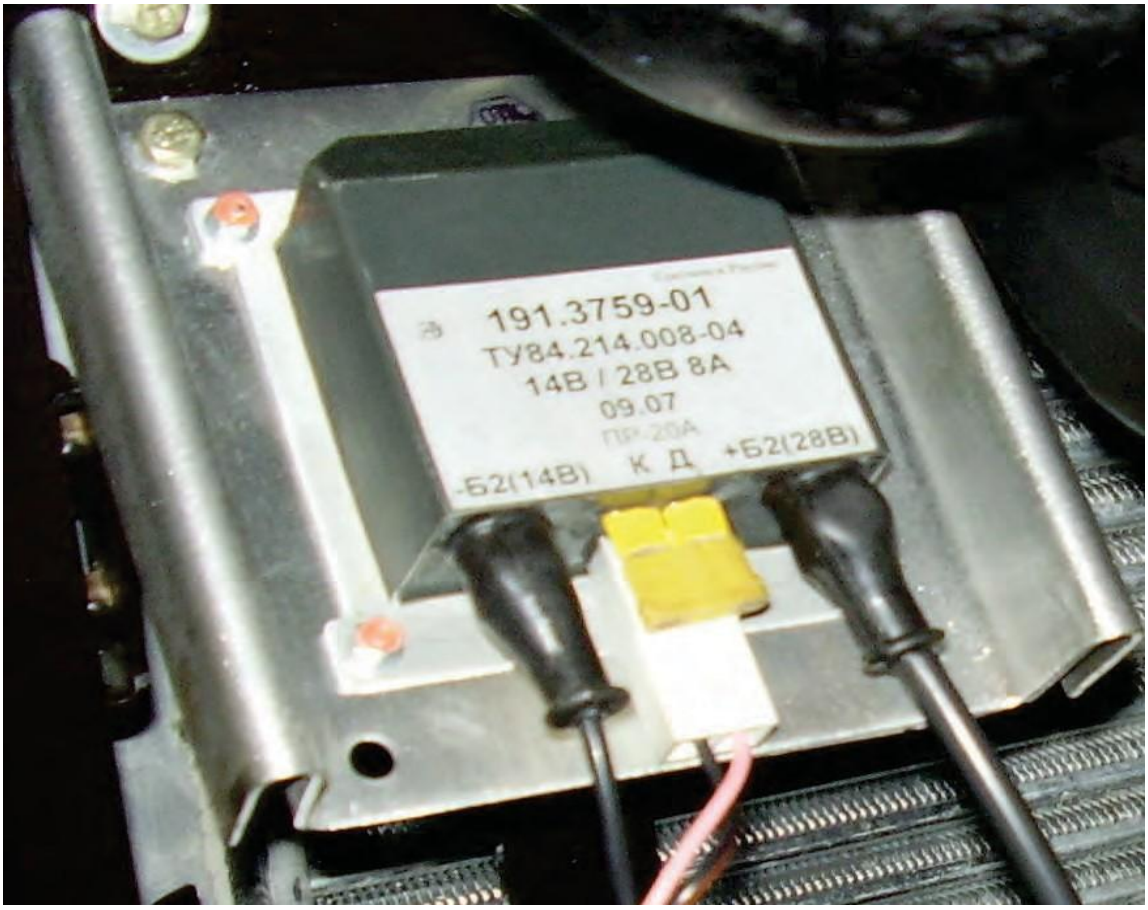


Figure 6.11

The voltage converter UZ1 is an electronic device intended to charge the second battery GB2 by converting and adjusting charge voltage, its operation is based on the principle of conversion.

The converter stable operation depends on availability of a non-faulty negative circuit on the converter body.

Power supply system

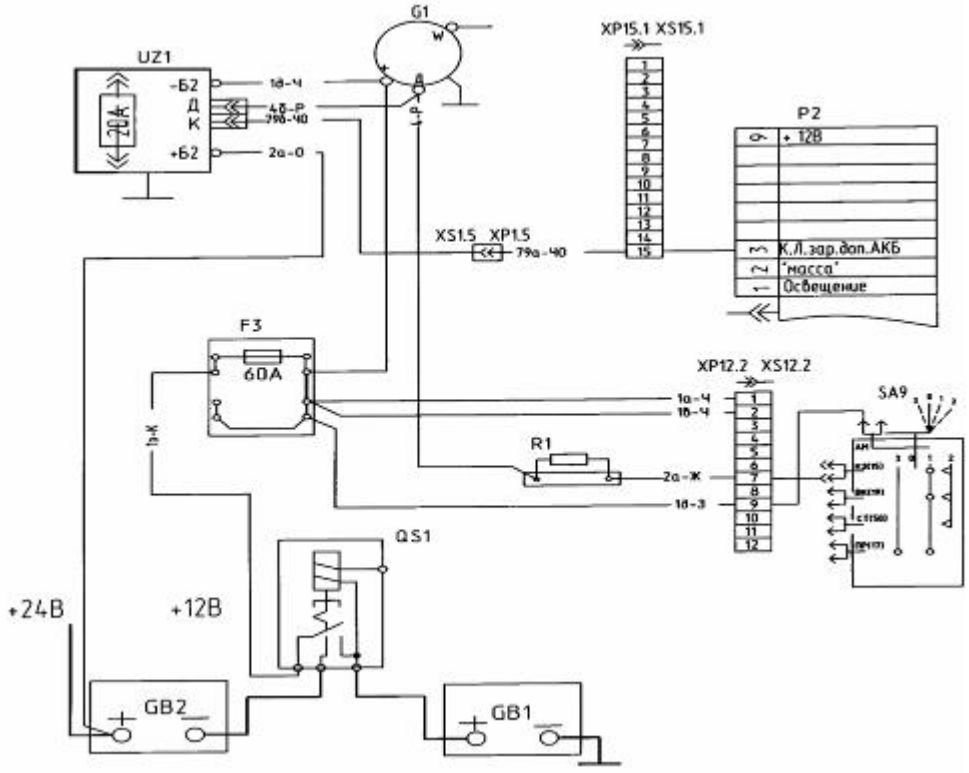


Figure 6.12

<u>To protect the converter at hazards it is provided as follows:</u>

- mounting of a fuse for 20A current in "+Б2" circuit, in the converter body;
- the converter operation is blocked until voltage from the "Д" terminal of the alternator is delivered to it (this voltage appear only as the alternator turns on after the engine start-up) and no voltage is converted;
- should the input voltage increase up to 15.4 – 16V and the converter temperature up to +125°C the converter will also get blocked; <u>To test operability of the power supply system the following components are provided on the tractor dashboard:</u>
- voltage dial with scale range of 10-16V, which is intended to control the charge state of the storage battery GB1 and the operability of the alternator G1;
- pilot lamp (red LED) is mounted in the voltage dial body and is linked to the terminal "К" of the voltage converter; it will light up when the charging current in the "+Б2" circuit of the converter goes drops to 0.5А and below.

The pilot lamp operation algorithm is as follows:

- the pilot lamp is on with the dials on before the engine is started – this points at consistency of the control circuit "К" and at readiness of the converter for operation (the "+Б2" circuit is not powered);
- after the engine is started the line "+Б2" is exposed to current and the pilot lamp will go out thus confirming the storage battery GB2 is being charged.

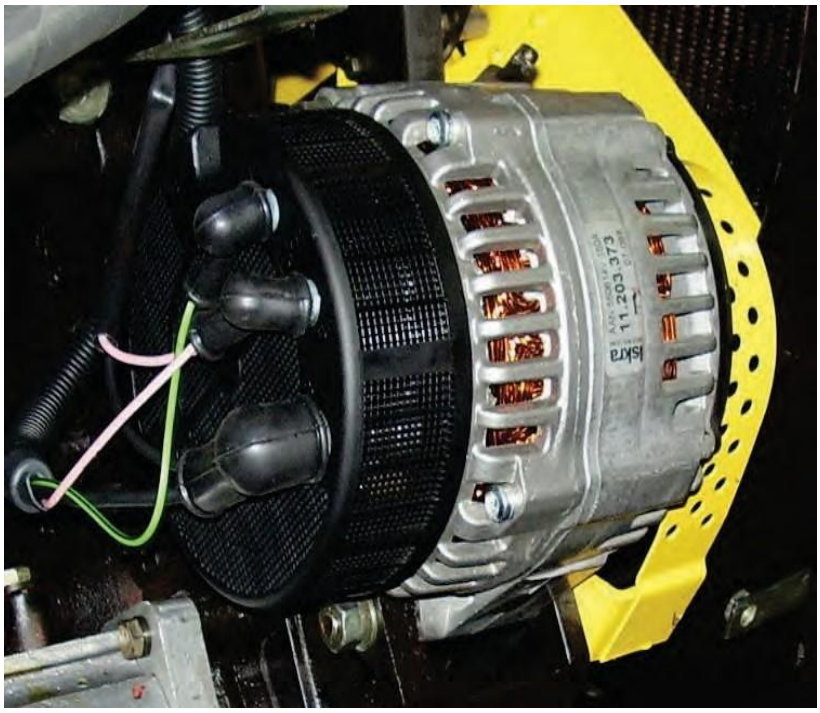


Figure 6.13

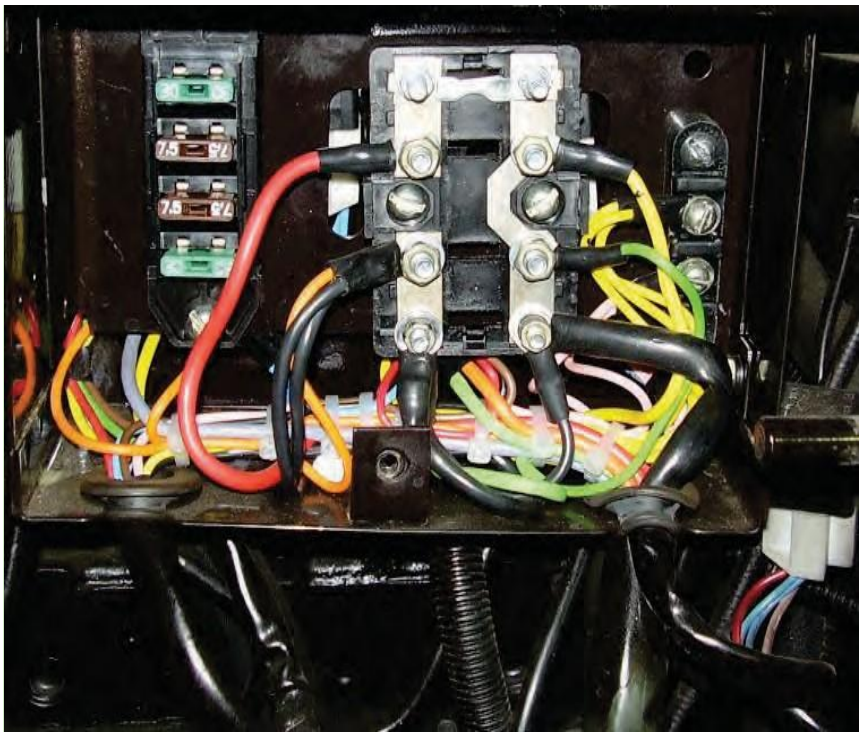


Figure 6.14

To avoid failure of the governor relay it is not allowed to check operability of the alternator by disconnecting the battery leads or by turning off the ground switch with the engine running!

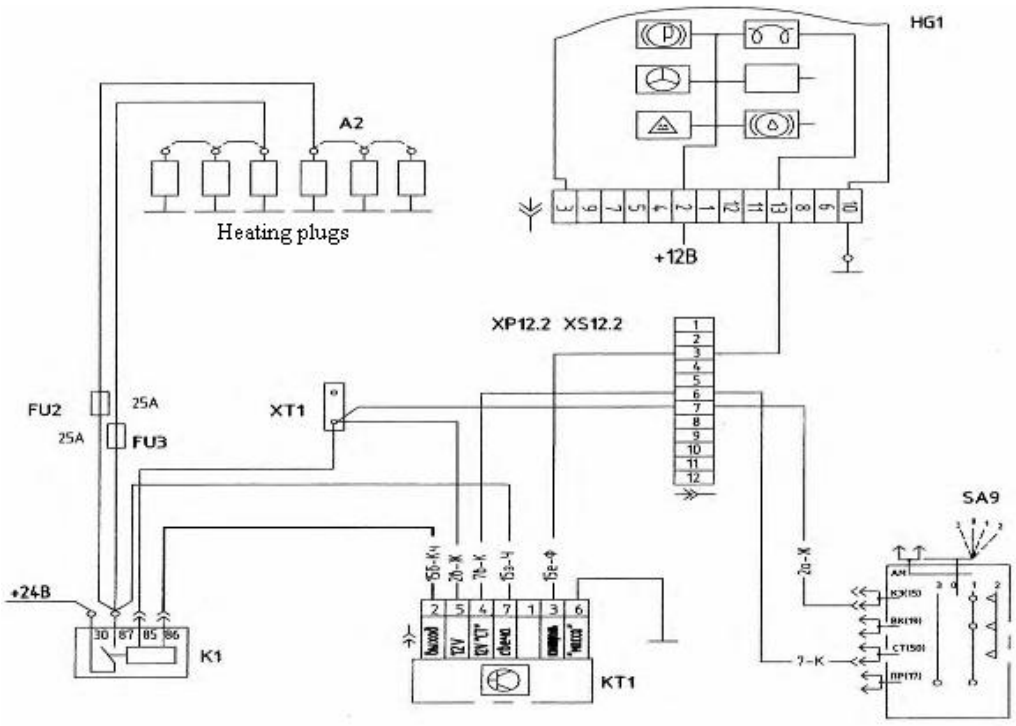


Figure 6.15

A2-heating plug 11 720 720 (23 volts); K1-
heating plugs relay;
KT1-heating plugs unit МУСН; HG-pilot
lamp unit AP 10.3803;
SA9-starter and instrument switch 1202.3704-03.

The wiring of the engine start-up facilitation system is connected with the tractor starting system, namely, the heating plugs rated voltage corresponds to the starting system rated voltage. If the starting system rated voltage make 24V, heating plugs will the 24V plugs, respectively, hereby the tractor on-board voltage will be 12V. This wiring solution is widely applied to “Belarus” tractors.

The heating plugs unit KT1 (electronic unit) is one of the basic components in this system. As shown in the diagram the unit controls directly the electromagnetic relay K1 and the pilot lamp in the pilot lamp unit HG1.

Its functions are as follows:

- controlling the heating plugs operation mode;
- delivering the information to the driver in the form of pilot lamp indication on the dashboard;
- controlling the system operability and watching emergencies.

The electromagnetic relay K1 is a heavy-duty relay intended to switch the heating plug power circuit. The relay coil rated voltage is 12V and has a polarity. The 24V plugs are connected through the relay contacts.

The electronic unit controls the electromagnetic relay which in its turn switches the heating plug power circuit. The electronic unit runs automatically in one of preset modes. However, some function of choosing the mode is assigned to the driver who will estimate the situation basing on the engine (ambient) temperature mode.

KT1 (for 1523 series in the relay box on the engine)
(for 920/952/1021/1025 series in the dashboard)

Figure 6.16

K1 (for 1523 series in the relay box on the engine)
(for 920/952/1021/1025 series on the oil tank)

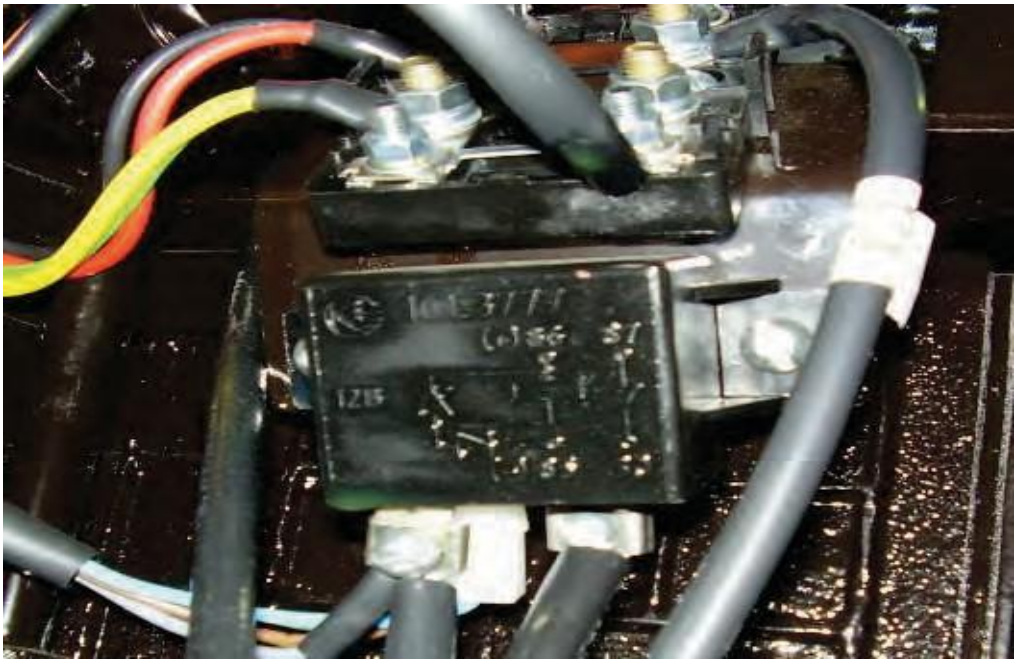


Figure 6.17