

MANUFACTURER:



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AGRICULTURAL TRACTOR PRONAR-320AM/320AMK



OPERATION MANUAL

Edition II

Narew, 05/ 2007

AGRICULTURAL TRACTOR PRONAR-320AM/320AMK OPERATION MANUAL

Edition II
Narew, 05/2007

FILLS THE SELLER:

Name and address of the point of
sale:.....

.....
.....
.....

User name &
address:.....

.....
.....

Tractor
type:.....

Chassis
serial:.....

Engine
serial:.....

Cab
serial:.....

Next Authorised Service Station
(ASS):.....

.....
.....

Purchase
date:.....

Warranty expiry
date:.....

.....

Tractors have been manufactured according to the technical description used for type approval.



The operation manual is the principal equipment of the tractor.

Read the manual carefully before operation, observe safety rules.

In the case of loss or destruction purchase new copy of the manual from the manufacturer.

In the case of sale or lending supply the next user with the manual.

The seller should place at the first page the serial of the tractor (according to the type plate) and data of the point of sale.

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GENERAL INFORMATION

Within the text tractor's sides „LEFT” or „RIGHT” are defined while looking at the tractor from behind in the driving direction.

- Information in the manual is valid for the day of its elaboration. As a result of improvements some values or drawings in the manual can not correspond to actual status of the delivered tractor

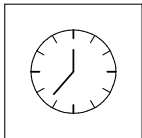
The PRONAR Narew preserves the right to introduce modifications without prior notice; Information about major design alterations will be supplied to users in the form of annexes to the manual.

CAUTION – with this word is marked information, which, if not observed, may cause tractor damage due to improper maintenance, adjustment and operation.

WARNING –information marked with this word determine operator's safety; their inobservance may endanger health or life.



pay special attention to recommendations marked with this sign



this sign means need of periodical maintenance

- PTS - power transmission shaft
Gb - gearbox
TM - technical maintenance
IN - inspection
RPM - revolutions per minute, min^{-1}
RH - rear three-point hitch
FH - forward three-point hitch
ASS - authorised service station
mth - motohours
TFS - tool fastening system (hitch)
TM - torque
HSS - hydrostatic steering system

Present MANUAL describes basic rules of safe operation & maintenance of the agricultural tractor.

ACCURATE observance of recommendations of the manual will ensure long-term and trouble-free operation of the machine.

TO avoid any problems or doubts concerning operation users should seek advice of the next authorised service point (ASS).

IF there is a need to replace any part use only parts produced or recommended by the manufacturer. Use of parts of non-verified quality may cause serious damage to the tractor.

We recommend to commission periodical technical INSPECTIONS and repairs to an ASS. While raising problems at a service station always give: tractor serial & tractor type and engine serial & type (given at the type plate).

The operator's SAFETY is ensured through the factory cab.

The tractors PRONAR-320AM/320AMK class 06 are the next offer of PRONAR – one of world's leaders among manufacturers of this type of equipment. We present this offer to the wide range of users because this tractor – depending to its equipment – is just irreplaceable for all types of work in:

- farms
- poultry farms
- transport & reloading
- building
- gardening & fruit-growing.

The PRONAR-320AM/320AMK is a novelty on the Polish market; its modern and durable components guarantee comfort and safety.

**THIS TRACTOR IS NOT ONLY A MACHINE,
IT IS YOUR NEW FRIEND**

**THANK YOU AND CONGRATULATIONS!
THIS PURCHASE WAS A GREAT IDEA!**

1. GENERAL REQUIREMENTS

- Read the manual carefully before operation; brief acquaintance may result in situations endangering operator's health or damage of equipment.
- The tractor should be operated by a driver certified with a suitable licence and authorisation; he should be also acquainted with principles of proper operation & maintenance of tractors, machinery and agricultural equipment.
- Tractors PRONAR-320AM/320AMK are fitted with a cab not adapted for transportation of passengers.

TRANSPORTATION OF PASSENGERS IN THE CAB IS PROHIBITED.

2. SAFETY REQUIREMENTS

Careful and consistent observation of safety rules and requirements as well as observation of traffic regulations protects the operator and other road users against all dangers. This ensures also optimal utilisation of tractor performances and protects it against failure, damage or destruction.

3. SAFE MAINTENANCE PRINCIPLES

- Prior to operation perform visual inspection of the tractor, and especially:
 - thread connections (fastenings) of cardinal tractor units: drive, traction system, steering, front axle, lighting and signalling
 - connection & towing appliances and their proper co-operation with agricultural equipment.

- DO NOT OPERATE THE TRACTOR IF YOU ARE NOT SURE THAT THE ENTIRE EQUIPMENT IS FULLY COMPLETE.

- For hinged and towed machines use only original bolts and original safeguards.
- Adjust the equipment fastening system so that fastened machines (tools) in their transport position are rigidly connected to the tractor.

PLAY IN THE TFS IS INADMISSIBLE

- Maintain the tractor and its equipment carefully, especially the brake system, steering system and lighting so that its technical condition is perfect; this guarantees YOUR SAFETY.
- Keep the tractor perfectly clean; all operations connected to washing, cleaning, preparation to work and maintenance after work perform with the engine on and with activated parking brake.
- DO NOT UNSCREW THE COOLER PLUG DURING ENGINE OPERATION; the pressure in the system is very high.
- While removing hot fluid from the cooling system (only if necessary) act very slowly and cautiously to avoid scalds.
- DO NOT COME CLOSE WITH OPEN FIRE (EVEN WITH A LIT CIGARETTE) to the tractor during filling with fuel, fuel system maintenance or inspection of batteries..
- Do not fit the tractor with parts or assemblies, which may introduce changes or modifications to its structure without prior consultation with the manufacturer.
- Do not connect to the tractor machines or agricultural tools, which are adapted for coupling with tractors of higher engine power or towing power. This may result in damage or serious failure of the tractor.

4. SAFE OPERATION PRINCIPLES

- Prior to starting the engine set the PTS for “OFF” and the gearbox lever for “N” (neutral).
- Do not start the engine from outside the operator’s cab. Start-up is possible only with the clutch off.
- Prior to moving forward release the parking brake and make sure that helpers are outside the direct danger zone (e.g. between the tractor and the connected machine).



WARN THEM WITH THE HORN

- DO NOT ABANDON THE CAB IN THE COURSE OF TRACTOR’S OPERATION OR MOVE.
- Before leaving the cab switch off the engine and activate the parking brake.
- Do not start-up the tractor in closed rooms or in rooms with damaged or ineffective ventilation (local); EXHAUST GAS is a DEADLY POISON.
- If the engine or the steering system appears to be out of order in the course of driving (or if making turn will require higher power at the steering wheel) – STOP IMMEDIATELY.
- During longer breaks lower connected machines to their rest position.
- Do not maintain the tractor and do not perform any operations while connected machines are in their upper position.

USE BALLAST – if front axle wheels start to lose contact with the ground – ballast weight should ensure tractor’s longitudinal stability. If the entire set of weights and the additional ballast (do not exceed the admissible load of tyres) do not guarantee sufficient adherence STOP THE OPERATION IMMEDIATELY. IT IS RECOMMENDED to use the ballast only if it is absolutely necessary.

- While manoeuvring the tractor or connected machines MAKE SURE that your manoeuvres will not cause a collision with co-operating people or objects resulting in dangerous situation (e.g. with electrical machines).
- Do not use articulated / telescopic shafts without guards for driving machines and tools from the PTS.
- Check connected machines only during stop and with PTS off.
- If using complementary or supporting devices check if they are suitable for co-operation with the tractor. Read their operation manuals.

DO NOT FORGET – it’s your tractor.

IF USED IMPROPERLY, MAY BE DANGEROUS TO YOU AND YOUR ENVIRONMENT. OPERATE ONLY THE EQUIPMENT ADAPTED FOR CO-OPERATION WITH YOUR TRACTOR.

5. SAFE DRIVING PRINCIPLES

- Be careful and judicious while driving the tractor. Match tractor's speed to terrain, especially while crossing bumps, on slopes and curves as well as in hills and while turning back.
- While working on slopes greater than 15° ALWAYS use maximum wheel track.
- Do not perform sharp turns while fully loaded and at great speed.

6. SAFETY RULES DURING TRANSPORT OPERATIONS

Observe Polish traffic regulations while driving on public roads.

- While driving on public roads the tractor should be equipped with warning reflecting triangle and marked with a triangular plate for slowly moving vehicles. If the tractor is connected to a machine or a trailer, the plate should be mounted at the connected machine.
- Driving the tractor while the lighting or the brake system is inefficient is strongly prohibited. Driving the tractor with disconnected electric and pneumatic systems may also cause an accident.
- Do not leave the disconnected trailer alone on public roads. In the case of failure drive to the verge and place the warning triangle (the obligatory equipment of each tractor and trailer) according to traffic regulations.
- Do not leave the tractor on slopes; if the stop is absolutely necessary lower the connected machine, switch tractor to first gear and activate the parking brake.
- Do not exceed 25 kph, do not drive from a slope with gearbox lever in neutral position or with pressed clutch pedal.
- Do not transport people in the cab, on the trailer or on coupled machines (PROHIBITED).
- Take care that independent brake pedals are coupled and their action simultaneous.
- Connect trailers only according to manufacturer's recommendations.
- Do not couple brakeless trailers weighing more than 750 kg.
- It is allowed to haul the tractor with the engine off only if its brake system is OK. and the speed does not exceed 10 kph.

7. SAFETY PRINCIPLES WHILE THE PTS IS ON

- While operating machines or tools driven via the PTS make sure that the PTS is off in following cases:
 - coupling or uncoupling the machine
 - machine maintenance.
- People close to rotating parts or elements should not wear loose clothing because it may lead to dangerous accidents.
- While operating stationary machines driven with the PTS always activate the parking brake, lock rear wheels on both sides and set front wheels as for driving forward.
- Do not execute operations connected to washing, adjustment or maintenance while the engine is on.

- Always use the umbrella guard; when the PTS is not in use put the protective cap on the PTS end.
- Do not use shafts for driving external machines without suitable guards.
- Always use properly matched (depending on torque value of driven machine) articulated / telescopic shafts. The torque value (Nm) is usually written on the PTS guard.

8. FIRE SAFETY PRINCIPLES

It is prohibited:

- to store petrol products in tractor garages
- to fill the tractor with fuel while the engine is on
- to light cigarettes, lighters, matches etc. and come close with open fire while the fuel is already replenished or its level checked
- to drive over inflammable substances or close to them in such way that the tractor's exhaust pipe outlet is close to such materials
- to start the engine in rooms made of inflammable materials
- to store oil-, kerosene- or petrol-soaked rags, oakum etc. in tractor garages
- to hit barrel or tank plugs with steel objects for the purpose to open them
- to operate the tractor if its exhaust conduits are polluted

If the fuel starts to burn smother the fire covering it tightly with asbestos (or tarpaulin) blanket or cover it with sand or ground.

Extinguishing fuel or grease with water causes quicker fire spreading and for this reason is inadmissible.

The tractor is not fitted with a fire extinguisher as a standard, thus we recommend the user to purchase for his own cost a GP-1X or BC-DB powder extinguisher and to fit it in the left rear part of the cab.

9. PRINCIPLES OF SAFE OPERATION ON A SLOPE

While operating on a slope or sloped fields the fuel should fill at least $\frac{1}{4}$ of the fuel tank volume to avoid aeration of the fuel system.

The tractor is designed for safe operation on slopes up to 15°. Avoid – if possible – driving the tractor crosswise the slope (recommended directions – up and down the slope). If the operation must be performed crosswise the slope, we recommend:

- to use the widest wheel track,
- to turn back in the slope direction,
- to raise the tool not higher as necessary for a manoeuvre (e.g. turn back)
- to check if the pressure in both wheels is the same,
- to reduce the speed to low,
- (while using a rotary plough) to start ploughing from the peak of the slope; in this case wheels on the peak side will move within a furrow reducing tractor's inclination angle.

10. MANUFACTURER'S WARRANTY

While selling a new tractor the manufacturer gives the warranty i.e. declares that the product is free of manufacturing or material failures, which could be detected within the production process.

The idea of warranty means that the warrantor (defined in the warranty book) will execute for his own cost any repair (including replacement of parts). The warranty book supplied together with the tractor contains detailed warranty regulations. The warranty book is the only document allowing the tractor user to make repairs in authorised service points (ASS) and is not subject of change.

CAUTION:

SEAL-PROTECTED COMPONENTS MAY BE REPAIRED ONLY BY AUTHORISED PERSONNEL OF REPAIR STATIONS. BREAKING THE SEAL MAKES THE WARRANTY VOID. SEALS ARE LOCATED ON: THE INJECTION PUMP, THE AIR PRESSURE REGULATOR OF THE PNEUMATIC SYSTEM, THE HYDRAULIC SYSTEM DISTRIBUTOR

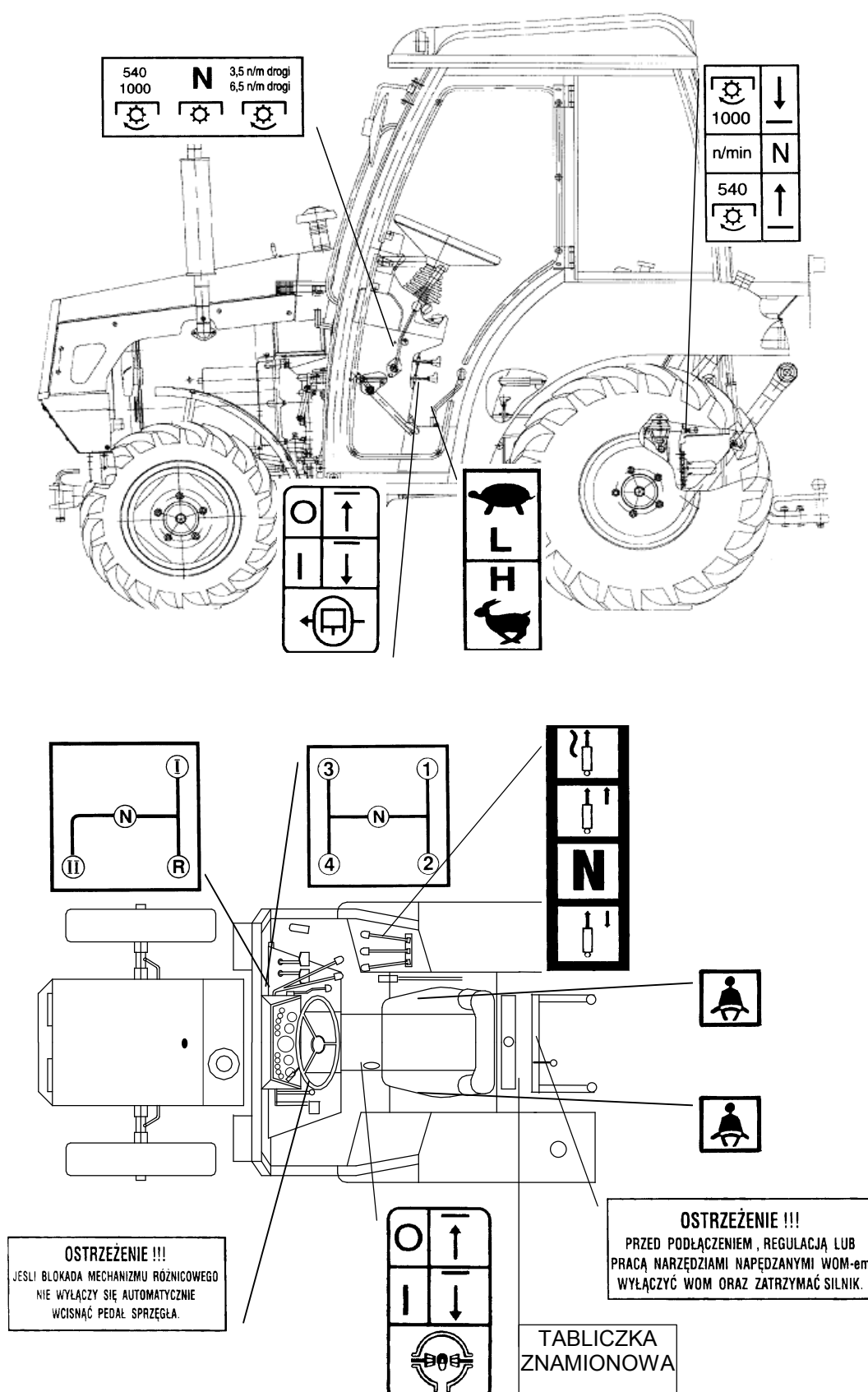
11. RECEIPT OF A TRACTOR BY THE USER

A brand new tractor should be started-up for the first time by a warranty mechanic or an authorised employee of the trade service.

The first start-up includes detailed visual inspection, operational test and instruction the user about cardinal operation principles. The presence of operational personnel is also recommended. The owner / user should be instructed about following questions:

- hints for safe tractor operation,
- location and meaning of tractor & engine numbers,
- indicators and control systems,
- running-in,
- starting-up & stopping,
- gear selection depending on operational conditions,
- driving on a tow with engine off,
- use & adjustment of brakes & clutch,
- use & adjustment of differential gear lock,
- use of PTS,
- use & controlling of the hydraulic system,
- coupling & uncoupling of tools to RH and FH,
- oil and grease lubrication points,
- oil replacement,
- replacement & cleaning of filters,
- operation and venting of the fuel system,
- cooling system, anti-freeze substances, tension of V-belts,
- maintenance of the wiring system,
- steering system, wheel track adjustment,
- tyre pressure,
- connection, use and controlling of the external hydraulic system,
- protection of nuts and screws,
- fuel transport & storage.


12. WARNING & INFORMATION STICKERS



13. TYPE PLATES

TRACTOR TYPE PLATE

The tractor type plate is situated outside in the rear, under the rear window pane.

 PRONAR Sp. z o.o. MADE IN POLAND		
Type: P1 (XXXXX)	EEC Number:	
Identification Number:		
Total permissible mass: 3 000 kg Permissible front axle load: 1 200 kg Permissible rear axle load: 1 800 kg	Permissible towable mass: - Unbraked towable mass: 900 kg - Independently-braked towable mass: 1 500 kg - Inertia-braked towable mass: 900 kg - Towable mass fitted with an assisted braking system (hydraulic or pneumatic): 5 000 kg	

Version	(XXXXX)
Wersja	
320A	(320A)
320AK	(320AK)
320AM	(320AM)
320AMK	(320AMK)

CAB TYPE PLATE

The cab type plate is situated inside the cab on the left at the cab frame.

PRONAR Sp. z o.o. 17-210 Narew ul. Mickiewicza 101A KONSTRUKCJA OCHRONNA typ:KS-01 do ciągników typu: P1 Nr atestu OECD 4/0 783 Nr fabryczny		S e1 0104
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1. TECHNICAL DESCRIPTION of the agricultural tractor PRONAR-320AM/320AMK.

		PRONAR-320AM	PRONAR-320AMK
I. GENERAL DATA.			
1	Vehicle type	agricultural tractor, wheeled	
2	Manufacturer (importer of components, assembly)	„PRONAR” Sp. z o.o..	
3	Model	PRONAR-320AM	PRONAR-320AMK
4	Type of body	with cab, closed, heated	
5	Location of the type plate:		
	-chassis	rear cab wall (outside, in the middle)	
	-engine	at the engine head cover	
	-protective cab	right side wall, inside the cab,	
6	Location of stamped numbers:		
	-chassis	at the type plate and cab frame, on the right (in its front part)	
	-engine	at the tractor type plate	
II. DIMENSIONS & WEIGHTS			
7	Length, mm	3420	3390
8	Width, mm	1565	
9	Height, mm	2360	
10	Number of axles, szt.	2	
11	Axle base, mm	1700	
12	Wheel base:		
	-front axle, mm	1250 , 1350	
	-rear axle, mm	1250, 1350	
13	Forward overhang, mm	870	
14	Rear overhang, mm	850	
15	Coupling device overhang:		
	-agricultural catch, mm	390	
16	Coupling device dimensions:		
	-catch bold diameter, mm	Ø25	
17	Clearance, mm	320	
18	Tractor dead weight, kg, incl:	1820	1735
	-front axle, kg	973	847
	-rear axle, kg	847	888
19	Admissible total weight		
	(tractor + coupled machine), kg	3000	
	Ballast: - front	160 kg + 15 kg bracket	N/A
20	Maksimum weight for:		
	-front axle, kg	1200	
	-rear axle, kg	1800	
21	Number of seats	1	

TECHNICAL DATA

B

		PRONAR-320AM	PRONAR-320AMK
22	Technically permissible towable mass:		
-	Unbraked towable mass [kg]:	900	
-	Independently braked towable mass [kg]:	1500	
-	Inertia-braked towable mass [kg]:	900	
-	Towable mass when fitted with hydraulic or pneumatic braking [kg]:	5000	
III. ENGINE.			
23	Make	MITSUBISHI HEAVY INDUSTRIES, LTD.	
24	Type	four-stroke, diesel	
25	Model	S4L2-Z261PT	
26	Engine placement	longitudinally, in front of the tractor	
27	Number & arrangement of cylinders	4-cylinder, vertical	
28	Cylinder diameter, mm	78	
29	Piston stroke, mm	92	
30	Cubic capacity, cm ³	1758	
31	Compression ratio	22	
32	Rated power, kW	25,7	
33	Rated rpm min ⁻¹ .	3000	
34	Maximum torque, Nm	98	
35	At rpm	2000	
36	Cooling system	liquid, forced	
37	Fuel supply system	injection pump	
38	Supercharging	N/A	
39	Cylinder stroke order	1-3-4-2	
IV. DRIVE UNIT			
40	Traction system	4x4	
41	Clutch type	friction, dry, single-disc	
42	Gearbox type:	mechanical, unsynchronised	
	-number of gears forward	2x2x4 =16	
	-number of gears rearward	2x1x4 =8	
43	Control type	manual, levers	
44	Transmission & speed for each gear	see Table 1	
45	Main transmission gear type	conical	
46	Transmission		
	-gearbox	see Table 1	
	-main transmission gear (rear)	4,125	
	-spur gear hub drives (rear)	4,818	
	-main transmission gear (front)	4,125	
	- spur gear hub drives (front)	3,923	
47	Other data	differential gear lock, lock against engine start-up when the gearbox lever is not on “N”	
V. SUSPENSION.			
48	Suspension type:		
	-front axle	rigid, self-aligning, on the axle bolt	

TECHNICAL DATA

B

		PRONAR-320AM	PRONAR-320AMK
	-rear axle	Rigid	
VI. KOŁA I OGUMIENIE.			
49	Wheel number (without spare)	4	
50	Wheel disc dimension:		
	-front	W7x16	
	-rear	W9x20	
51	Tyre dimension, PR number		
	-front	210/80 R16 lub 9,0/70-16 8PR	
	-rear	11,2 - 20 8PR	
52	Tyre pressure:		
	-front, kPa	160	
	-rear, kPa	210	
VII. STEERING SYSTEM.			
53	Steering gear	hydrostatic „Danfoss” or „Rexroth” with double-action cylinder in the tapered steering system	
54	Steering gear transmission:		
	-to the right	10	
	-to the left	10	
55	Steering wheel diameter, mm	360	
56	Co-operates with:	front wheels	
VIII. BRAKE SYSTEM.			
57	Operational brake:		
	-type	disc type, wet	
	-control	mechanical, footbrake	
	-effect to	2 wheels (rear axle)	
58	Emergency brake	N/A, see parking brake	
59	Parking brake		
	-typ	disc type, wet	
	-control	rmanally, with lever	
	-effect to	rear axle wheels	
60	Pneumatic control of trailer brakes	overpressure, single-conduit system	
IX. WIRING SYSTEM.			
61	Rated voltage	12 V	
62	Number & capacity of batteries	1 pc. 12 V / 88 Ah	
63	Generator type & power	alternator 12 V – 50A	
64	Starter voltage & power	12 V / 1,7 kW	
65	Frame-connected pole	minus	
X. POWER TRANSMISSION SHAFT (PTS)			
66	Type	dependent, independent	
67	Activation	mechanical	
68	Number of shafts	1	
69	PTS-540 min ⁻¹		
	-PTS end diameter (mm)	35	

TECHNICAL DATA

B

		PRONAR-320AM	PRONAR-320AMK	
	-number of keys	6		
70	PTS-1000 min ⁻¹			
	-PTS end diameter (mm)	35		
	-number of keys	21		
XI. THREE-POINT HITCH, REAR				
71	length of lower pull rods (mm)	680		
72	length of upper pull rod (mm)	480-650		
73	length of upper & lower rack (mm)	315-425		
74	distance between fastening axle and rear wheel axle in: -lowered position (mm) -raised position (mm)	220 405		
75	Hoist lifting capacity at 610 mm from tips of lower pull rods, kg	750		
76	Diameter of openings in pull rods: - lower (mm) - upper (mm)	Ø 28,7 Ø 25,5		
XI. THREE-POINT HITCH, FRONT, PRONAR-320AMK				
			version Pronar	version Mińsk
77	length of lower pull rods (mm)	-	435	620
78	length of upper pull rod (mm)	-	320-420	480-650
79	Operational travel of lower pull rod tips axes (mm)	-	545	420
80	Distance between tips of lower pull rods and ground with extremely lowered pull-rods (mm)	-	70	108
81	Distance between tips of lower pull rods and ground with extremely raised pull-rods (mm)	-	690	700
82	Hoist lifting capacity at 610 mm from tips of lower pull rods, kg	-	350	
83	Diameter of openings in pull rods: - lower (mm) - upper (mm)	-	Ø 28,7 Ø 25,5	Ø 28,7 Ø 25,5
XII. AGRICULTURAL CATCH				
84	Adjustment	hydraulic		
85	Distance (horizontal) between catch bolt axis and front of PTS end (mm)	400		
86	Distance (vertical) between catch symmetry axis and PTN end axis (mm)	130		
87	Bolt diameter (mm)	25		
88	Maximum admissible vertical load (kN)	5		

XIII. UPPER TRANSPORT CATCH		
84	Rated towing power, kN	8,5
85	Rotation angle round vertical axis	360°
86	Height of rotation axis above base plane, mm	665
87	Admissible trailer weight with load and brake system, kg	3500
88	Bolt diameter, mm	Ø30
XIV. OPERATIONAL DATA.		
89	Minimum turn back diameter: (without use of independent wheel brake, left or right)	
	-left, mm	5800
	-right, mm	5800
90	Minimum turn width, mm	2250
91	Maximum speed, kph	27.5
92	Fuel	diesel
93	Number & capacity of fuel tanks	1, 32 dm ³
94	Measured fuel consumption, g/kWh	267,0
95	Oil capacity in:	
	-engine, dm ³	5,1
	-drive system, dm ³	17,4
	-hydraulic system, dm ³	19
96	Cooling system capacity, dm ³	10

1. INSTRUMENT PANEL

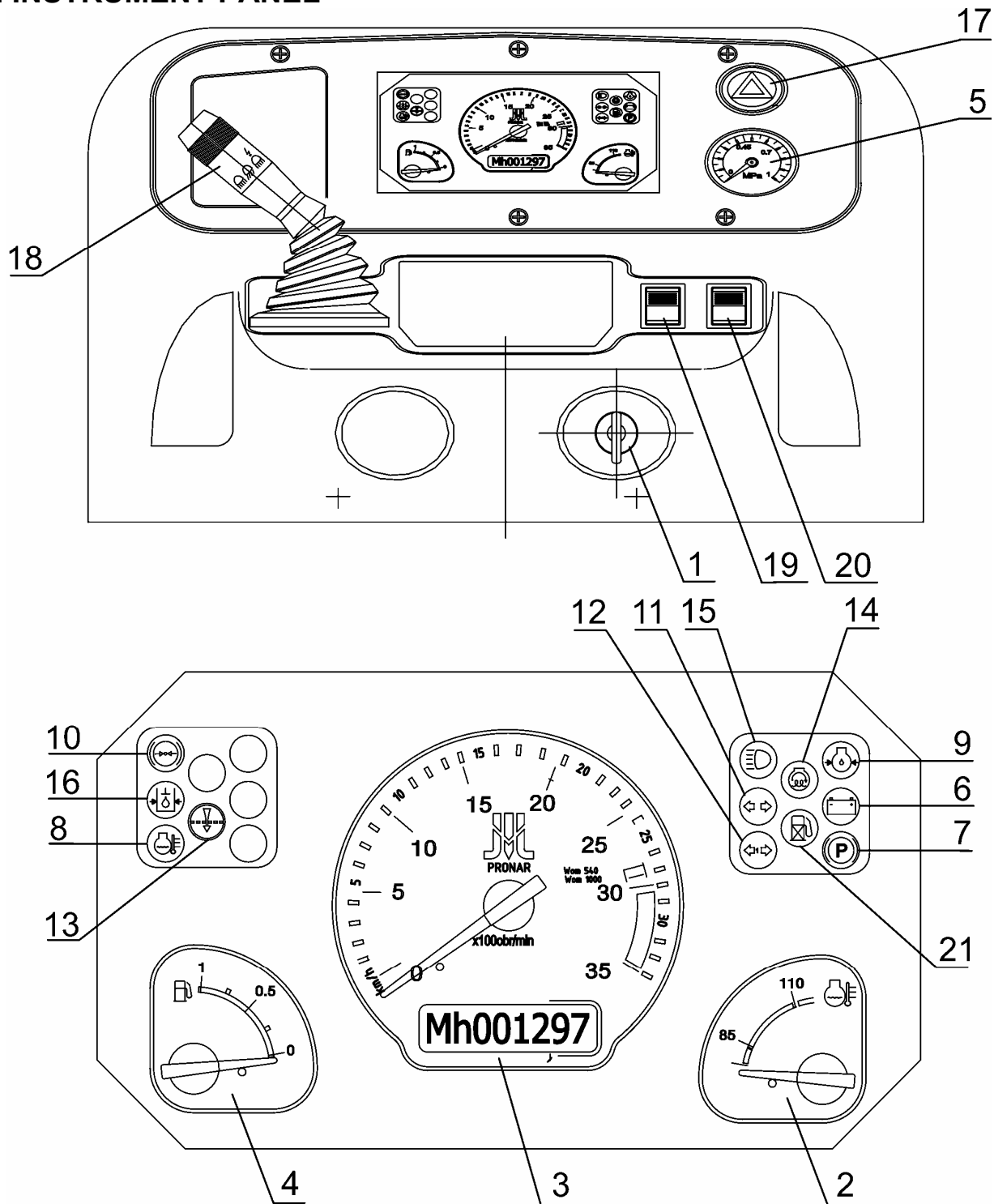
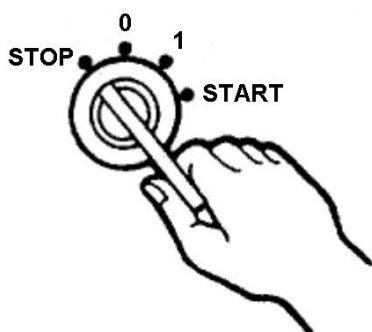


Fig. C-1. Instrument panel PRONAR-320AM/320AMK

1- starter & instrument panel switch (ignition switch); 2-coolant temperature; 3-rpm & speed; 4- fuel level (0-1/2-1); 5-pneumatic system pressure (manometer); 6-battery charging indicator lamp; 7-parking brake indicator lamp; 8-coolant overheat indicator lamp (above 110 °C); 9-low oil pressure (engine lubrication) indicator lamp; 10-low air pressure (pneumatic system) indicator lamp; 11-tractor blinker indicators; 12-trailer blinker indicators; 13-air filter contamination indicator lamp (option); 14-heater plug indicator lamp (off when the plug is ready for engine start-up); 15-road lights indicator lamp; 16- low oil pressure (steering system) indicator lamp; 17- emergency light switch; 18- multi-function switch; 19- additional road light switch (PRONAR-320AMK); 20- control switch for additional electric bundle with connector in front of the tractor (PRONAR-320AMK); 21- unused

POS. 1. STARTER & INSTRUMENT PANEL SWITCH (IGNITION SWITCH)



Start the engine by turning the key to 1. When the heater plug lamp goes off turn the key to START for maximum 10 seconds. If the engine fails to start try again after 30 seconds. We recommend to make 3 trials at most. If the engine still fails to start find the reason (failure) and repair it.

Fig. C-2 Starter & instrument panel switch (ignition switch)
0- neutral; 1- activation of instruments, indication lamps and heater plugs;
START- starter on; STOP- engine stop.

Caution. When the pressure is off the key comes back automatically from START to 1 and from STOP to 0.

POS. 2. COOLANT TEMPERATURE GAUGE

Normal coolant temperature should be within the range $80 \div 95^{\circ}\text{C}$. If the gauge pointer goes over the red field the engine is overheated – it is necessary to find the reason. Possible causes are:

- to low coolant volume in the cooling system;
- insufficient fan drive V-belt tension;
- external or internal cooler contamination.



Negligence in removing the reason of overheating may lead to serious engine damage.

POS. 3. RPM - METER - shows engine rpm, tractor speed and number of motohours (see Fig. C-3)

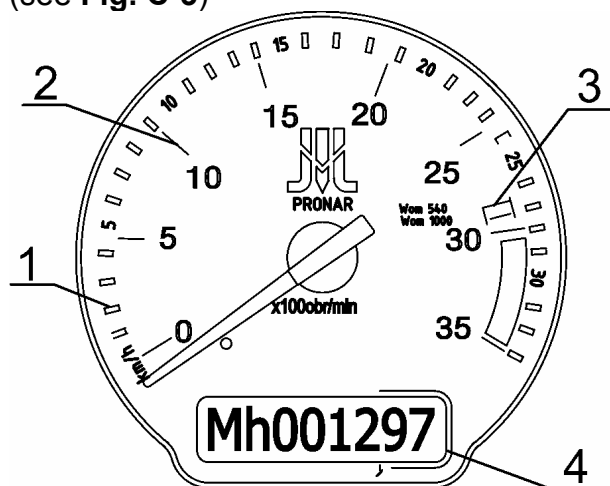


Fig. C-3. Rpm-meter.

Yellow (1): - tractor speed scale in kph ;
White (2): - engine shaft rpm scale
Green (3): - engine shaft rpm range where the PTS rotates 540 or 1000 rpm
Motohour counter (4): - (shows engine mileage with accuracy of 1/100 mth).

POS. 4. FUEL LEVEL GAUGE

POS. 5. PNEUMATIC SYSTEM AIR PRESSURE GAUGE (MANOMETER)- shows the air pressure in the pneumatic system for trailer braking. The pressure should be within the range $0.45 \div 0.7 \text{ MPa}$.

POS. 6. BATTERY CHARGING INDICATOR LAMP

POS. 7. PARKING BRAKE INDICATOR LAMP

POS. 8. COOLANT OVERHEAT INDICATOR LAMP – lights on when the temperature exceeds 110°C.

POS. 9. LOW OIL PRESSURE (ENGINE LUBRICATION SYSTEM) INDICATOR LAMP – lights on when the oil pressure falls below the limit value. Also lights on when the ignition key is set to 1.

POS. 10. LOW AIR PRESSURE (PNEUMATIC SYSTEM) INDICATOR LAMP – lights on when the air pressure falls below the limit value (0,45 MPa).

POS. 11. TRACTOR BLINKER INDICATORS

POS. 12. TRAILER BLINKER INDICATORS;

POS. 13. AIR FILTER CONTAMINATION INDICATOR LAMP (OPTION)

POS. 14. HEATER PLUG INDICATOR LAMP – lights off when the plug is ready for engine start-up.

POS. 15. ROAD LIGHTS INDICATOR LAMP

POS. 16. LOW OIL PRESSURE (STEERING SYSTEM) INDICATOR LAMP

CAUTION: Momentary lamp blinking is admissible.

POS. 17. EMERGENCY LIGHTS SWITCH – first pressing switches on emergency lights (indicator lamp blinks) next pressing – switches off lights;

POS. 18. MULTI-FUNCTION SWITCH

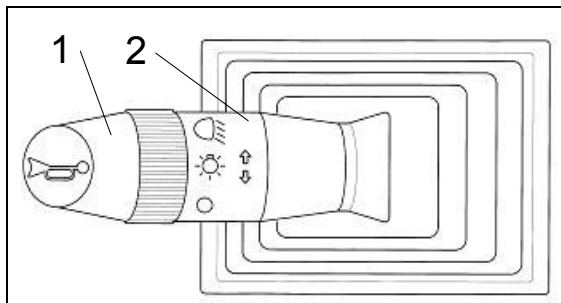


Fig. C-4 Multi-function switch:
1- knob; 2-lever

The multi-function switch works as follows:

- turn the knob 1 to ☀ - position lights on;
- turn the knob 1 to ☀ - dim lights on;
- shift the lever 2 to ☀ - road lights on;
- shift the lever 2 upward – momentary activation of road lights;
- shift the lever 2 forward – right blinker;
- shift the lever 2 backward – left blinker;
- press the button marked 📢 - horn

POS. 19. ADDITIONAL ROAD LIGHTS SWITCH
(PRONAR-320AMK)

POS. 20. CONTROL SWITCH FOR ADDITIONAL ELECTRIC BUNDLE WITH CONNECTOR
IN FRONT OF THE TRACTOR (PRONAR-320AMK)

2. UPPER CAB PANEL

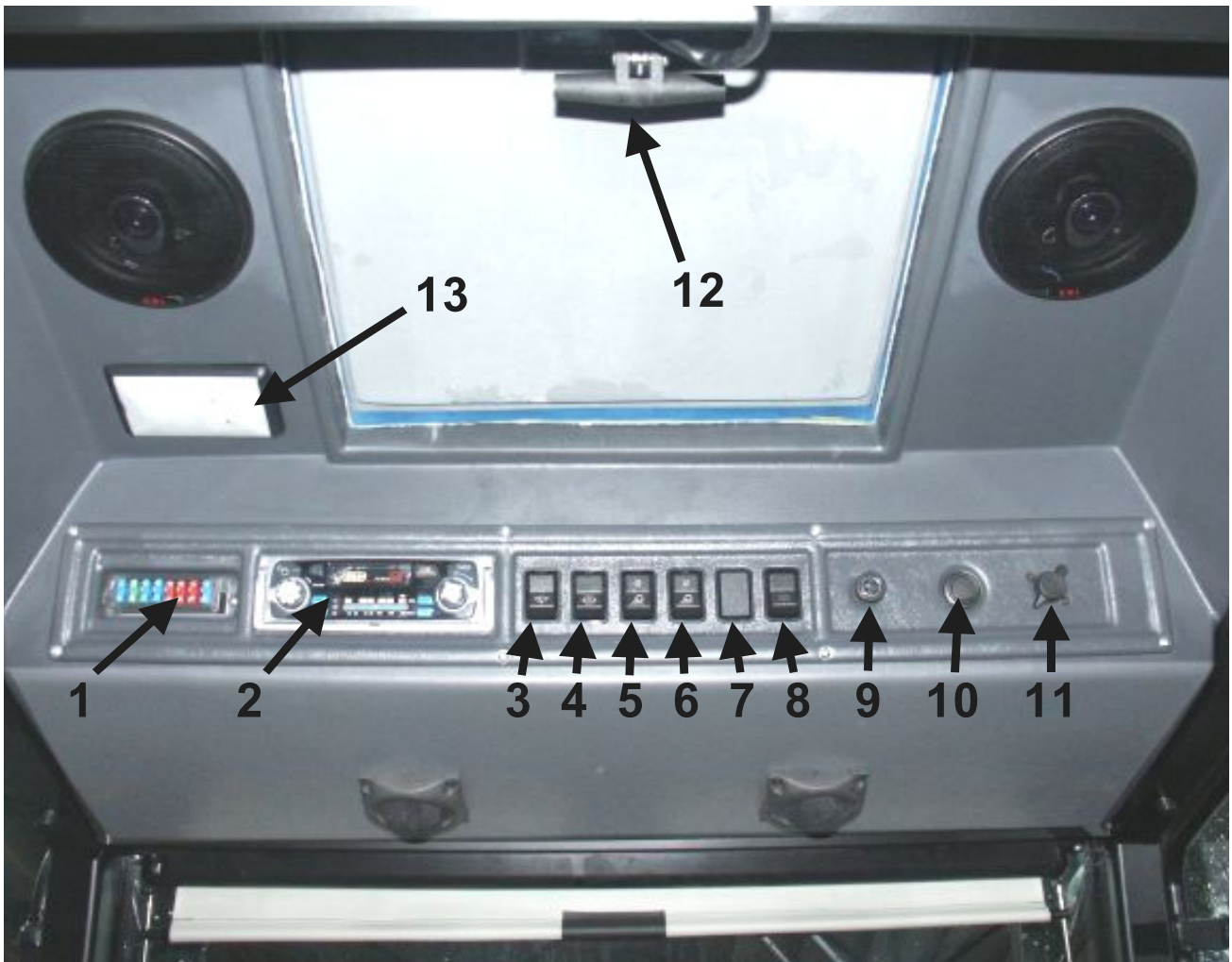


Fig. C-5 Upper cab panel

1- cab fuses box; 2- radio (option); 3- windscreen wiper switch (two-speed); 4- windscreen washer switch; 5- front cab lights switch; 6- rear cab lights switch; 7- unused switch; 8- rear window wiper (standard) and washer (option) switch; 9- air blow speed control knob; 10- lighter; 11- air blow temperature control knob; 12- cab roof flap handle; 13- cab lighting switch

3. CONTROL & FUNCTION LEVERS PRONAR-320AM/320AMK

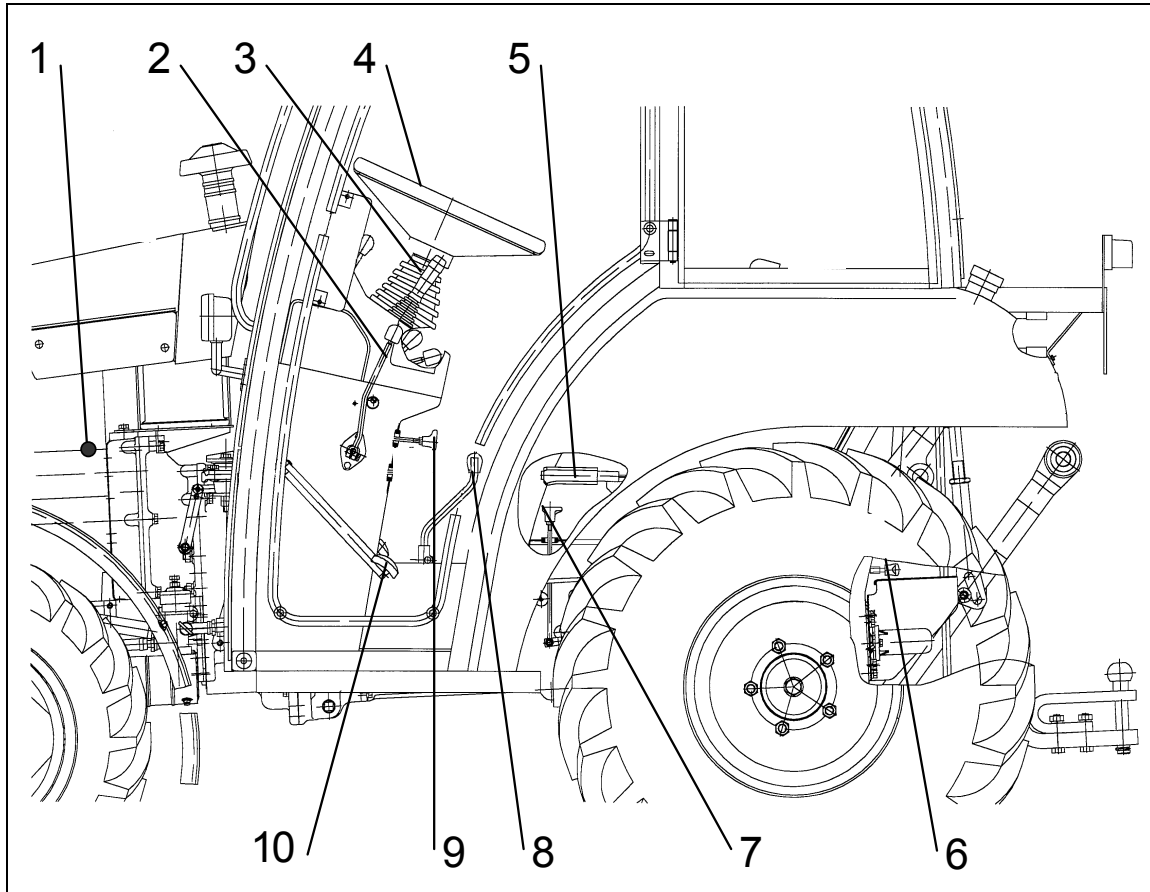


Fig. C-6 Control & function levers – side view.

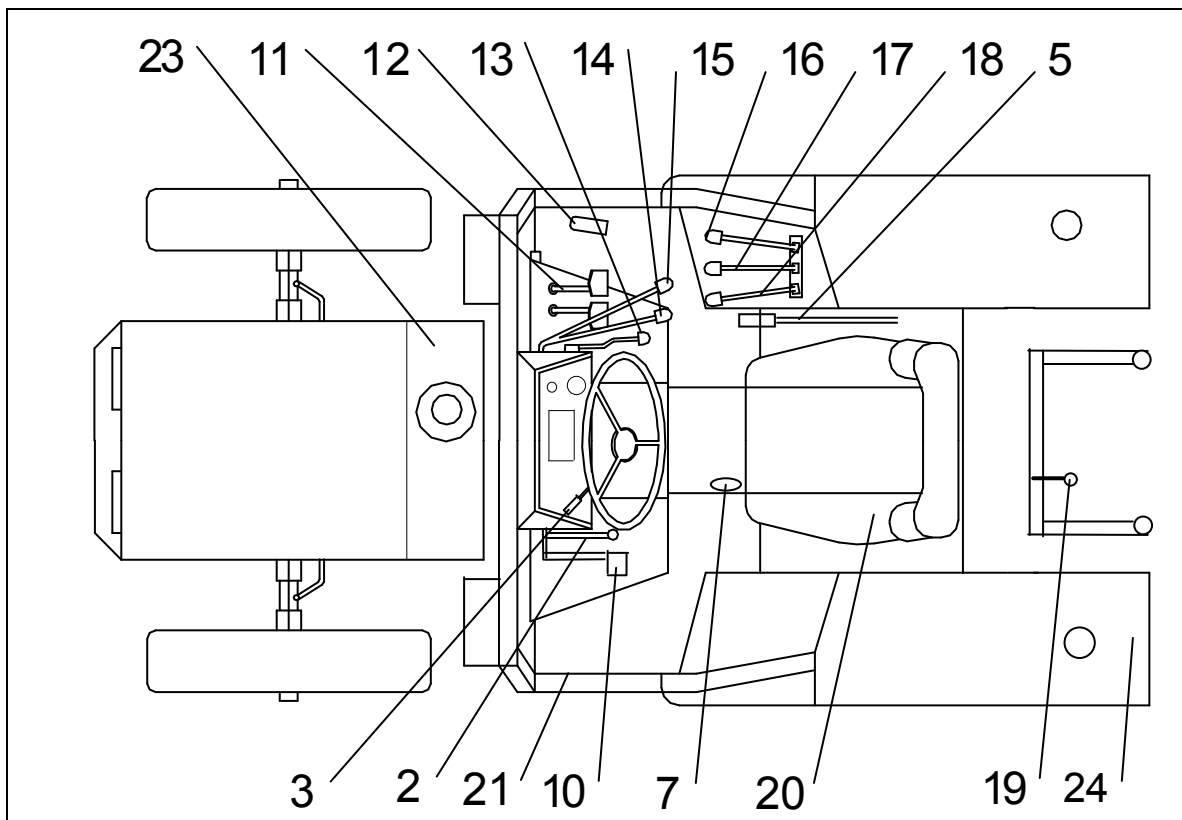
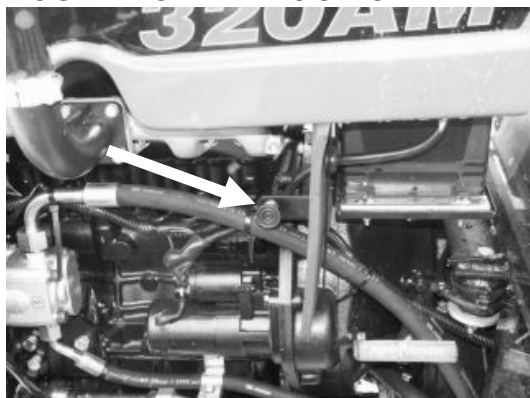


Fig. C-7 Control & function levers – upper view.

POS. 1. BONNET LOCK CABLE.

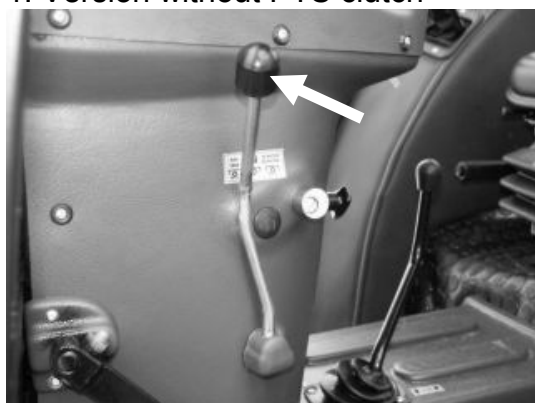


Prior to opening the bonnet remove filter air inlet cover and pull off the bonnet lock cable.

Fig. C-8 Bonnet lock cable

POS. 2. REAR PTS CONTROL LEVER. (Fig. C-6, C-9)

1. Version without PTS clutch



Shifting the lever forward – “independent PTS” on, rearward – “dependent PTS” on, central position – neutral.

By shifting the lever we can select various PTS operation range.

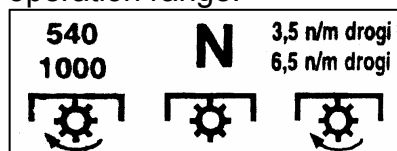
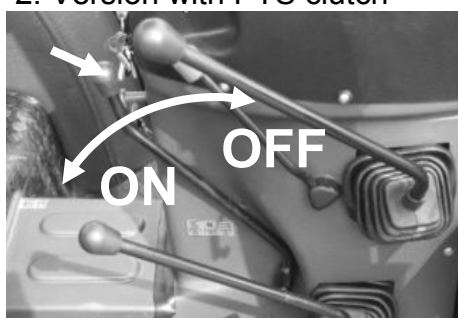


Fig. C-9a Rear PTS control lever + pictogram.



The lever in neutral position = PTS drive off

2. Version with PTS clutch



We can switch on the PTS drive without stopping the tractor and disengaging the gearbox.

Fig. C-9b Rear PTS control lever + pictogram.

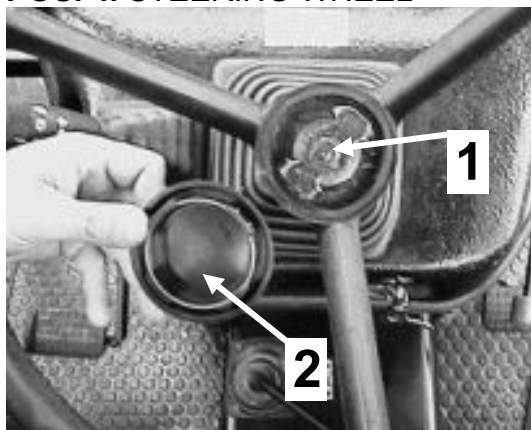


The lever in upper position = PTS drive off

POS. 3. MULTI-FUNCTION SWITCH (Fig. C-4)

Working principle of the multi-function switch is described in POS.18 page 18

POS. 4. STEERING WHEEL

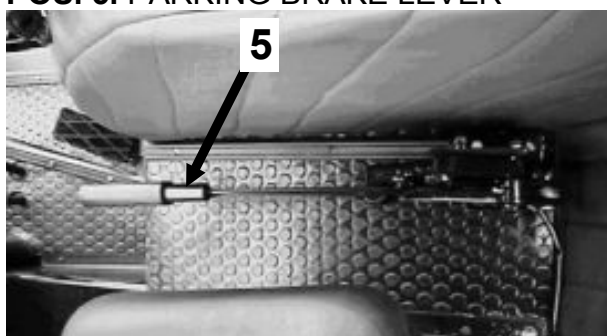


Prior to changing position of the steering wheel on the axle (Fig. C-10):

- remove steering wheel axle cover 2;
- unscrew the butterfly nut 1 (3 ÷ 5 turns);
- set the steering wheel to freely chosen position within the 100mm adjustment range;
- tighten the butterfly nut 1 (manually) and install the cover 2.

Fig. C-10 Changing position of the steering wheel on the axle.
1 – butterfly nut; 2 – steering wheel axle cover

POS. 5. PARKING BRAKE LEVER

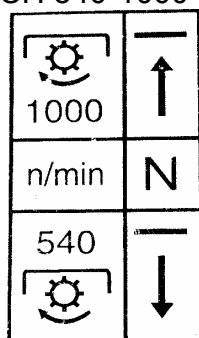


The parking brake is designed for immobilising the tractor during a stop.

It is prohibited to use the parking brake while the tractor moves. The only exception is an emergency situation when during move – without previous failure symptoms – the main brake becomes ineffective.

Fig. C-11 Parking brake lever (5).

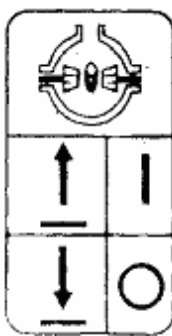
POS. 6. PTS RPM TOGGLE SWITCH 540-1000 RPM



Toggling the PTS rpm is described at the page.68

Fig. C-12 PTS rpm toggle lever 540-1000 + pictogram.

POS. 7. CONTROL LEVER FOR REAR AXLE DIFFERENTIAL GEAR LOCK.



Lever up - the differential gear is locked, lever down - unlocked (Fig. C-13).

Fig. C-13. Control lever for rear axle differential gear lock (7)

POS. 8. REDUCTION GEAR LEVER/CABLE (TRANSMISSION RATIO CHANGE)

The reduction gear lever/cable has two positions. While moving the lever/cable:

- **rearward (or upward)**- increased transmission ratio on (H) „hare”.
- **forward (or downward)**- lowered transmission ratio on (L) „turtle”;

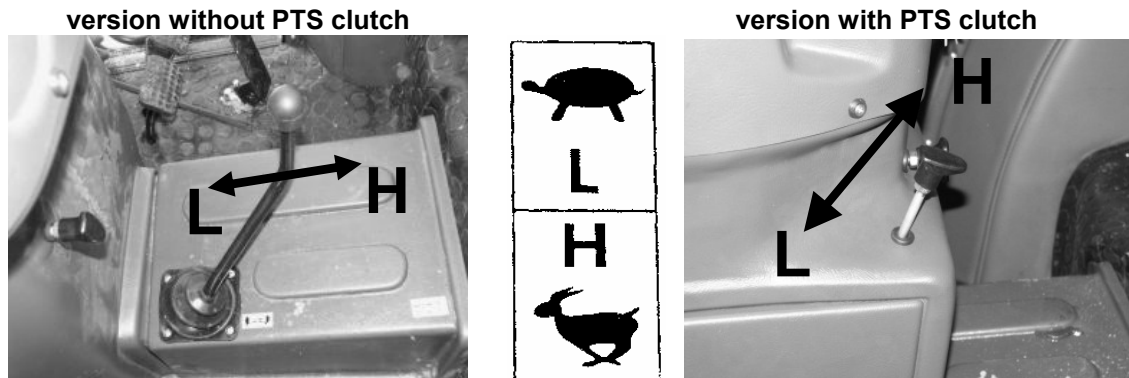


Fig. C-14 Gearbox reduction gear control lever/cable + pictogram.

POS. 9. STEERING COLUMN POSITION CLUTCH CABLE.



By pulling the cable towards him the operator can release the column position clutch and set one of three positions (step every 5°). By releasing the cable the column is locked in selected position.

Fig. C-15 Steering column position clutch cable.

POS. 10. CLUTCH PEDAL – by pressing the clutch pedal the transmission from the engine to the gearbox is disengaged.

POS. 11. WORKING BRAKES CONTROL PEDALS



While driving on roads the brake pedals should be locked with the clutch. During field operation, when performing of turns of small radius is necessary, it is possible - after unlocking the clutch – to brake each wheel independently by pressing the relevant (right or left) pedal .

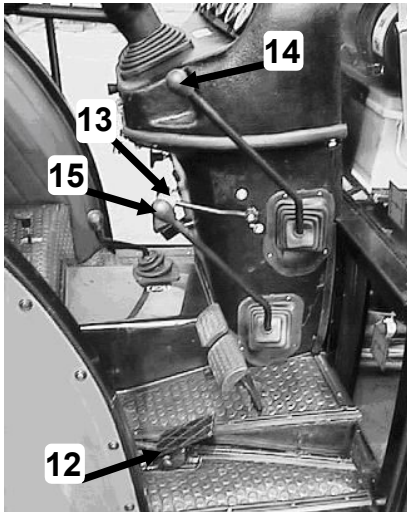
Fig. C-16 Working brakes control pedals

Brake smoothly, without jerking, pressing the pedal as far at it will go without stopping in intermediate positions. Do not rest feet on pedals unnecessarily, because it may cause premature brake lining wear.



While driving on roads lock the working brake (footbrake) pedals with the clutch.

POS. 12. FUEL DOSAGE CONTROL PEDAL



The pedal works independently from the manual lever for fuel dosage adjustment and increases the fuel dosage according to engine rpm increase. The engine returns to previous (set with the manual lever) rpm value after the pedal is released. Full adjustment range is accessible when the lever is set to the rear position.

Fig. C-17 Control levers – view from the right side

POS. 13. FUEL DOSAGE MANUAL LEVER – is designed for adjustment of selected rpm.

By pushing the lever:

forward – dosage increase,

rearward – dosage decrease.

POS. 14. GEARBOX LEVER – is designed for gear change acc. to following diagram:

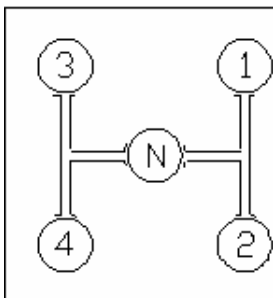


Fig. C-18 Gear change diagram.

POS. 15. GEAR RANGE SELECTION LEVER – is designed for selection of gear range (I,II forward; R backward).

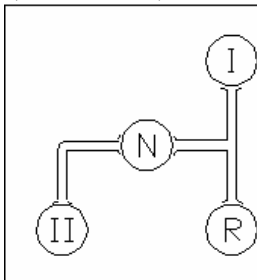


Fig. C-19 Gear range selection diagram.

POS. 16. RH HOIST CONTROL DISTRIBUTOR LEVER (REAR)

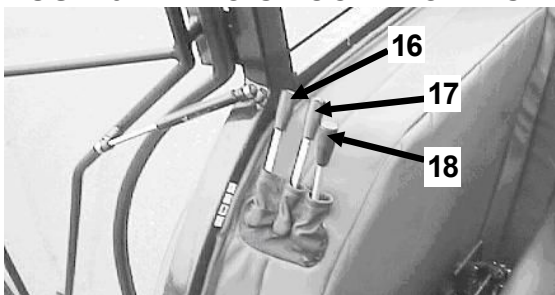


Fig. C-20 Hydraulic distributor levers.

POS. 17. EXTERNAL HYDRAULIC (QUICK-RELEASE CONNECTORS) OR FRONT HITCH (if installed) CONTROL DISTRIBUTOR LEVER

POS. 18. EXTERNAL HYDRAULIC (QUICK-RELEASE CONNECTORS) CONTROL DISTRIBUTOR LEVER OR UNUSED

POS. 19. RH SHAFT LOCK LEVER



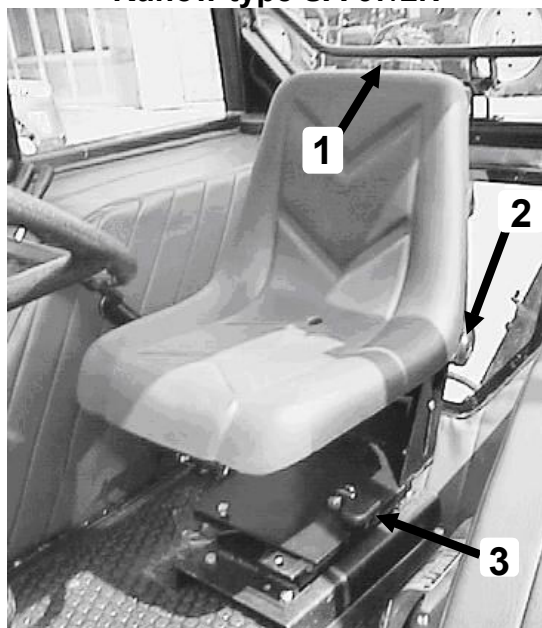
Lever shifted forward (toward driving direction) - RH locked in upper position. Lever shifted rearward – lock released.

Fig. C-21 RH shaft lock lever.

POS. 20. OPERATOR SEAT

PRONAR-320AM tractors may be fitted with one of two seat types:

Kunów type SA 67/2N



COBO type GT 50/M91



Fig. C-22 Operator seat 1-shock absorption adjustment knob (depending on operator's weight); 2-vertical adjustment; 3- horizontal adjustment.

1. Shock absorption adjustment knob. Setting depends on operator's weight. To set greater weight turn the knob right.

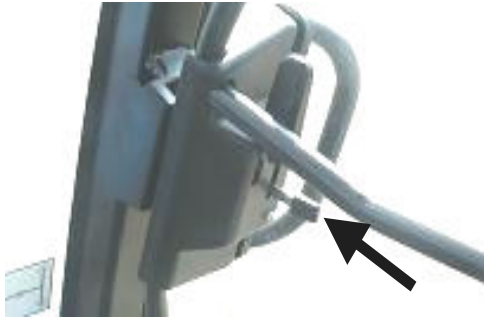
2. Seat height adjustment knob. The adjustment may be realised through:

Kunów S.A. 67/2N: loosening the knobs **2** on both sides of the seat, setting the seat to required height manually and tightening the knobs **2**.

COBO GT 50/M91: turning the knob **2** right causes lowering of the seat, turning left – raising of the seat.

3. Horizontal seat adjustment lever. The lever is designed for positioning of the seat in horizontal plane. To change position press hard the lever handle **3**, shift the seat in horizontal plane and release the lever **3** allowing the rack to mesh.

POS. 21. CAB DOOR LOCK.



Handles on right and left door can be locked from inside by shifting the lock lever downward.

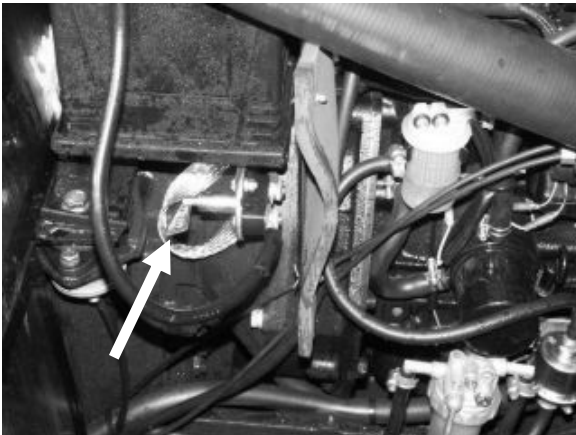
Fig. C-23 Cab door lock .

POS. 22. CAB ROOF FLAP HANDLE



Fig. C-24 Cab roof flap handle.

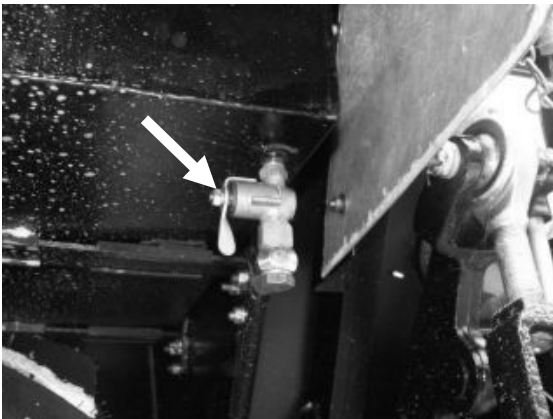
POS. 23. FRAME SWITCH



The frame switch is situated on the left side of the engine just below the battery.

Fig. C-25 Frame switch.

POS. 24. FUEL TAP



The fuel tap is situated under the left wing near to the fuel tank.

Fig. C-26 Fuel tap.

1. BEFORE START-UP

Prior to start-up of a new or a long-garaged tractor perform following actions to ensure proper, trouble-free tractor operation and operator safety:

- check if all guards are complete, check their fastening;
- check engine & gear oil level; replenish if necessary;
- check and – if necessary – adjust tension of V-belts;
- check operation of clutch, brakes, fuel dosage lever, adjust if necessary;
- check general condition of tyres, tyre pressure, wheel fastening, traces of leakage, remove possible failures (if any);
- check operation & condition of gauges / indicators and also – if the tractor will be used on public roads – additional equipment i.e. warning triangle, rear view mirrors, warning sign for slowly moving vehicles etc., switch off all power receivers (e.g. lights);
- check fuel level;
- check if the fuel tap is open (Fig. C-26);
- make visual inspection if the tractor is complete; check threaded connections, tighten if necessary;
- check if the parking brake is activated (should be activated if the tractor is stopped);
- check coolant level, replenish if necessary.

2. NORMAL START-UP



CAUTION:

START THE ENGINE SLOWLY AND ONLY FROM OPERATOR SEAT;
MAKE SURE THAT THE PARKING BRAKE IS ON.

To start-up the engine:

- set frame switch (on the left side of the engine) to “on” (Fig. D-1)

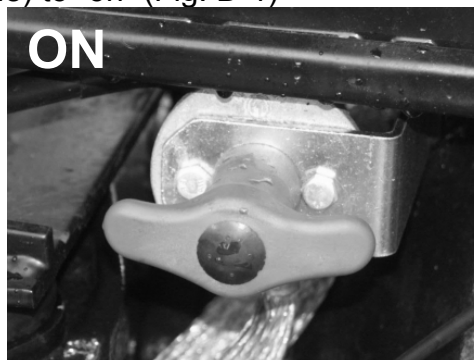


Fig.D-1 Location of the frame switch

- set the gear range selection lever, the gearbox lever and the PTS lever to neutral position
- disengage the clutch by pressing its pedal as far as it goes; set the gearbox lever to left outer (upper) position and keep it in this position
- turn the ignition switch to „1” (page 17; Fig. C-2), and, when the heater plug indicator lamp is off, to START. If the engine starts release the key, the gearbox lever and the clutch pedal.

CAUTION:

1. Continuous starter operation should not be longer than 10 s.
2. If the engine fails to start try again after 30 seconds

CAUTION:

AFTER A FEW UNSUCCESSFUL START-UPS FIND THE REASON OF SUCH SITUATION AND REMOVE IT.

CAUTION:

WHILE USING FOR START-UP AN EXTERNAL POWER SOURCE MAKE SURE THAT CONNECTION POLARITY IS CORRECT. FIRST CONNECT THE „+” CABLE TO THE „+” POLE AND THEN THE „-” CABLE TO THE „-” POLE (AS SHOWN ON THE DIAGRAM BELOW)

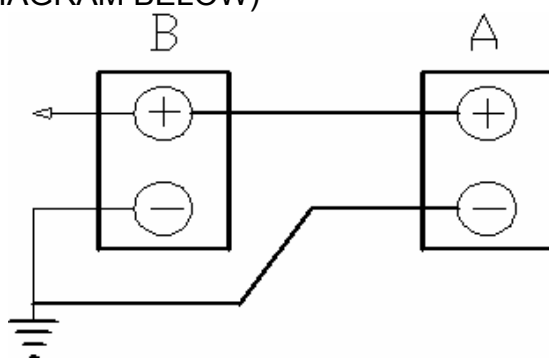


Fig. D-2
A – auxiliary battery;
B – main battery.

3. START-UP AT LOW TEMPERATURES

The engine of the PRONAR-320AM tractor is equipped with heater plugs, which make start-up at low temperatures less difficult. The automated heater plug control system provides also warming-up of heater plugs for ca. 10 seconds after start-up to eliminate white smoke during cold start-up.

The system work as follows:

- 1- warms-up the air in the whirl chamber of the engine head up to suitable temperature
- 2- the indicator lamp signals readiness for start-up.

CAUTION:

- USE ONLY FUEL ADEQUATE TO THE SEASON. VERY LOW TEMPERATURES MAY CAUSE PARAFFIN PRECIPITATION FROM THE SUMMER FUEL AND MAKE ENGINE OPERATION IMPOSSIBLE.
- ALWAYS CHECK THE TYPE OF PURCHASED FUEL DURING WINTER SEASON. TIME OF AIR WARMING-UP WITH HEATER PLUGS (FROM THE MOMENT OF SWITCHING ON WITH THE KEY TO THE MOMENT WHEN THE INDICATOR LAMP GOES OFF) DEPENDS ON COOLANT TEMPERATURE
- DUE TO HIGH POWER CONSUMPTION DURING START-UP CHECK CONDITION OF BATTERIES

4. START MOVING

When the engine is on:

- reduce the engine speed (rpm) to required value,
- press the clutch pedal as far as it will go, select the gear range (I, II, R) and insert the gear
- set the reduction gear lever according to your needs (H/L),
- release the parking brake,
- increase slowly the engine speed and simultaneously release the clutch pedal,
- take the foot off the clutch pedal and increase the fuel dosage slowly until reaching required rpm.

CAUTION:

1. SELECTION OF THE GEAR RANGE, THE GEAR AND THE REDUCTION GEAR SHOULD BE PERFORMED ONLY IF THE CLUTCH PEDAL IS COMPLETELY PRESSED DOWN
2. TOGGLE GEARS WHILE THE TRACTOR IS MOVING (WITHOUT STOPPING).
3. TOGGLE THE H/L REDUCTION GEAR ONLY WHEN THE TRACTOR IS COMPLETELY STOPPED
4. SELECTION OF REAR GEAR RANGE CAN BE PERFORMED WITHOUT SETTING THE GEARBOX LEVER TO NEUTRAL POSITION



CAUTION:

IT IS PROHIBITED TO START THE TRACTOR MOVING UNTIL THE RED INDICATOR LAMP SIGNALLING LOW PNEUMATIC SYSTEM PRESSURE IS ON AND THE MANOMETER SHOWS PRESSURE LOWER THAN 0,45 MPa

- WAIT UNTIL THE COMPRESSOR FILLS THE COMPRESSED AIR TANK (THE RED LAMP GOES OFF) AND THE MANOMETER SHOWS PRESSURE IN THE RANGE 0,45-0,7 MPa.

5. STOP

To stop the tractor:

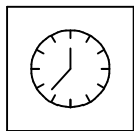
- reduce the engine speed,
- press down the clutch pedal completely,
- set reduction & gear levers to neutral position,
- release the clutch pedal,
- brake the tractor with the parking brake,
- switch off the engine by turning the key to **STOP** (page 17; Fig. C-2). When the engine is off the injection pump controller toggles automatically to "start-up dosage" position. During the next start-up there is no need to increase fuel dosage with the gas pedal.



CAUTION

IN EMERGENCY SITUATIONS E.G. LIFE DANGER, COLLISION, THE TRACTOR CAN BE STOPPED SUDDENLY BY SIMULTANEOUS PRESSING DOWN THE CLUTCH PEDAL AND BOTH BRAKE PEDALS.

6. RUNNING IN



During the running-in period observe hints given below to ensure tractor's long life:

- during first 15 mth the tractor should be used only for light transport operations,
- during next 15 mth the tractor should be applied for light field operations with use of the hoist,
- use low gears while transporting heavy loads,
- check condition of screwed connections,
- during first 10 mth of tractor's operation it is recommended to switch the clutch on and off frequently (but cautiously) to ensure correct arrangement of clutch discs,
- during first 50 mth take special care of clutch pedal lost motion; if the lost motion becomes smaller adjust it immediately,
- do not overload the engine during running-in; do not cause "engine smoking" and rpm falling down; watch carefully indications of measuring / controlling instruments,
- during first 50 mth do not exceed 70% of rated engine power.

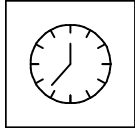
CAUTION:

1. BY ANY SYMPTOMS OF INCORRECT ENGINE / TRACTOR OPERATION STOP THE TRACTOR AND CALL THE NEXT ASS. DURING RUNNING-IN PERIOD WARMING UP OF BODIES OF TRACTOR UNITS ABOVE 70°C (343°K) IS INADMISSIBLE (RISK OF SEIZING).
2. After the RUNNING-IN period commission to the next ASS the „Maintenance after 50 mth" in the scope recommended by the warranty book and by the maintenance manual for the 50 mth inspection (Chapter E; page 44) .

1. OIL, COOLANT & FUEL LEVEL INSPECTION AND REPLENISHMENT, LUBRICATION POINTS

CAUTION:

MAKE SURE THAT DURING OIL LEVEL INSPECTION THE TRACTOR IS STANDING ON LEVEL GROUND.



Clean nipple and greaser end before lubrication. Lubricate with LT-42 or LT-43 grease every 125 mth following points:

- front knuckle bolts (Fig. E-7, POS.10; Fig. E-9, POS. 12)
- power drive cylinder bolts (Fig. E-10, POS. 15; Fig. E-11, POS. 16)
- shaft sleeves of front & rear hitches (Fig. E-17, POS. 22,23).

A. ENGINE

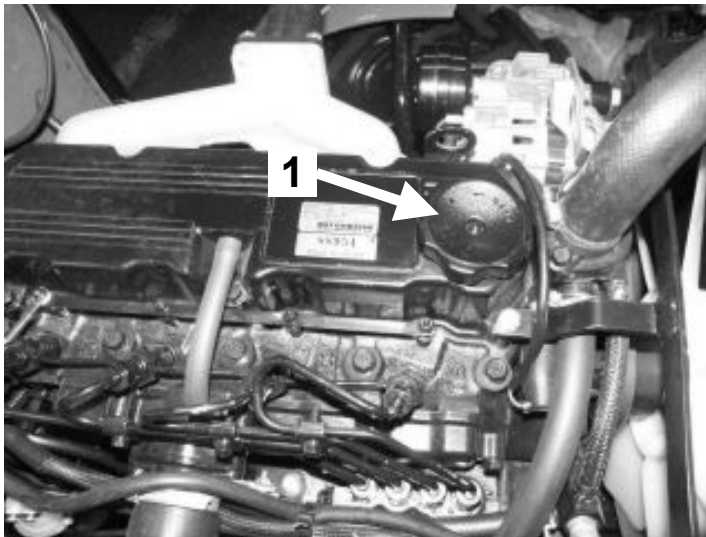


Fig. E-1 Engine oil filling plug (1)
(view from above)

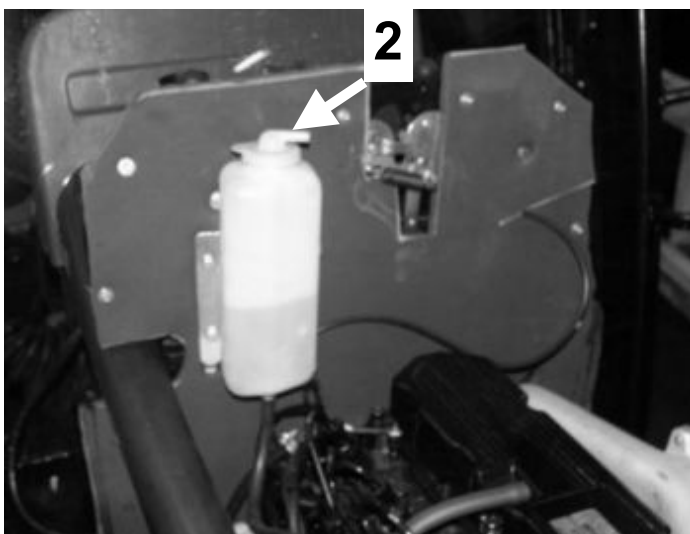


Fig. E-2 Coolant replenishment plug in
the balancing tank (2)

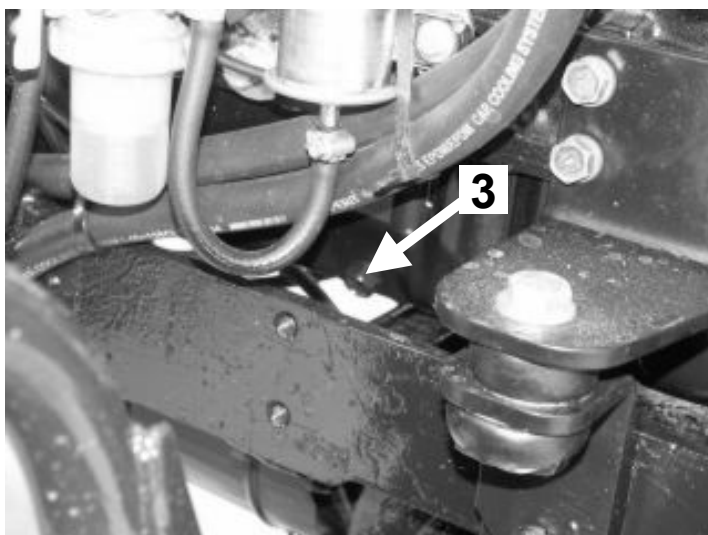


Fig. E-3 Oil drain plug (3)- on the left side of the engine

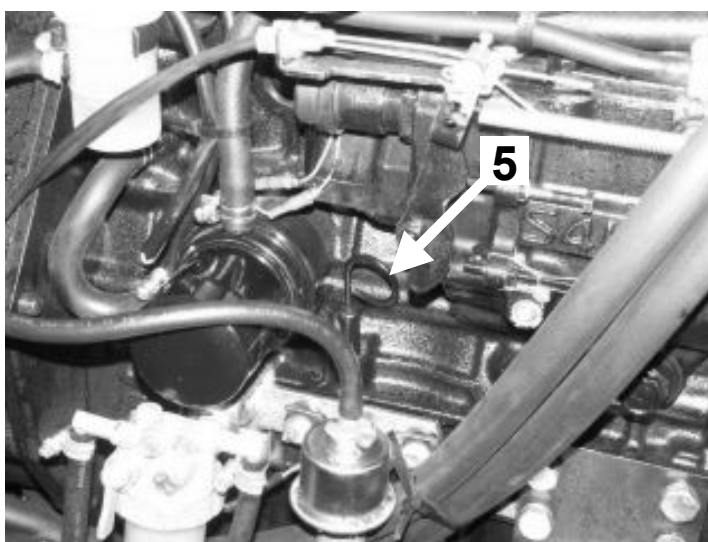


Fig. E-4 Engine oil dipstick location (5).

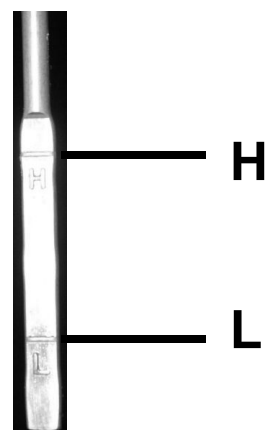


Fig. E-5 Engine oil dipstick, situated on the right side of the tractor. Oil level should stand between notches L and H.

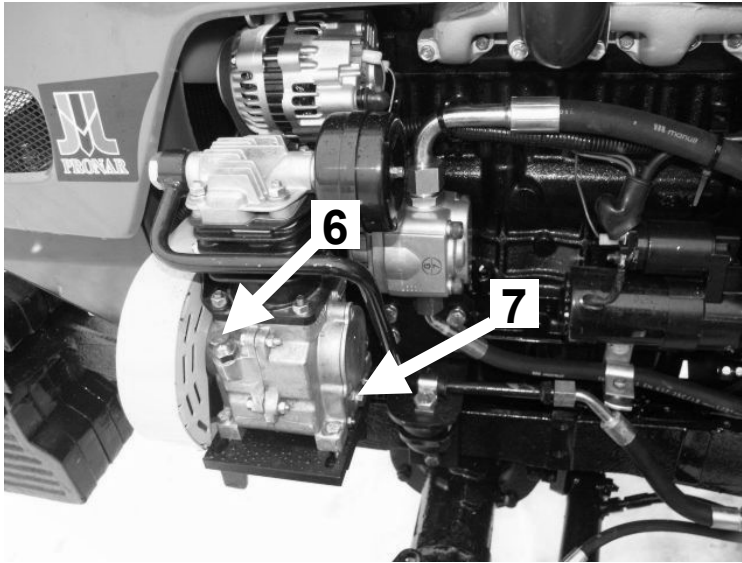


Fig. E-6 Compressor oil filling/inspection plug (6) and compressor oil drain plug (7),

B. FRONT DRIVE AXLE AND SPUR GEAR DRIVE FOR FRONT WHEELS

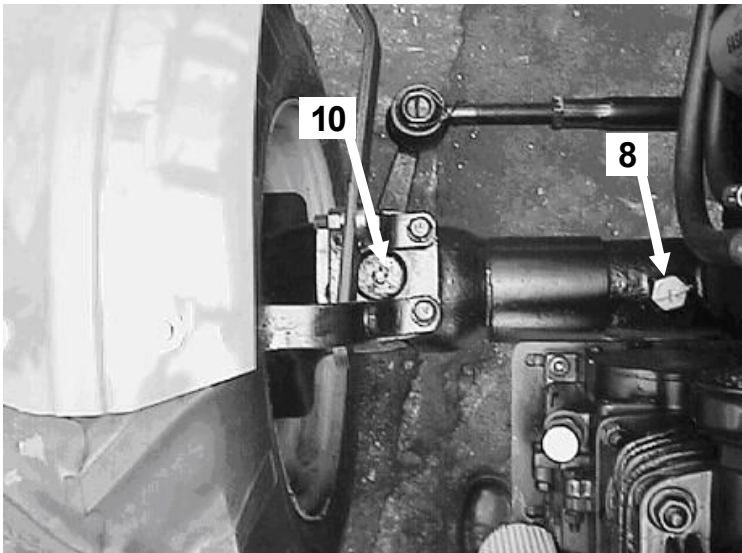


Fig. E-7 Oil filling plug / vent of the front drive axle (8) and the nipple of the axle upper bolt (10).

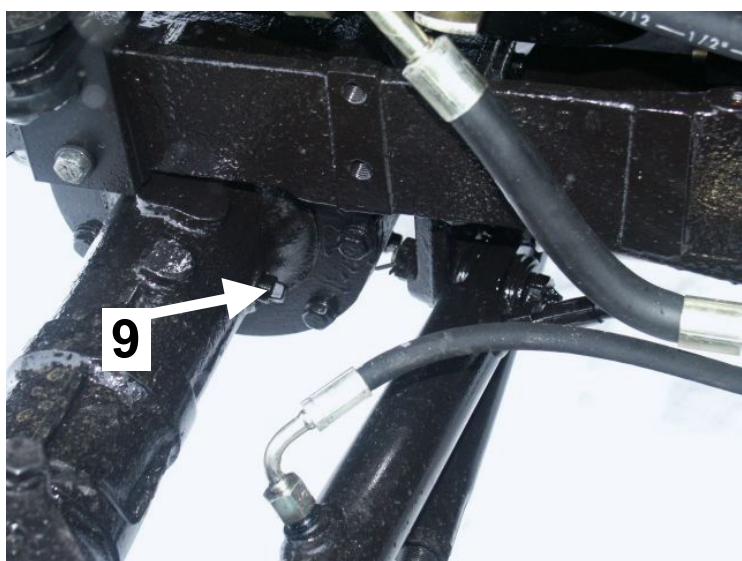


Fig. E-7a Oil inspection plug of the front drive axle (9).

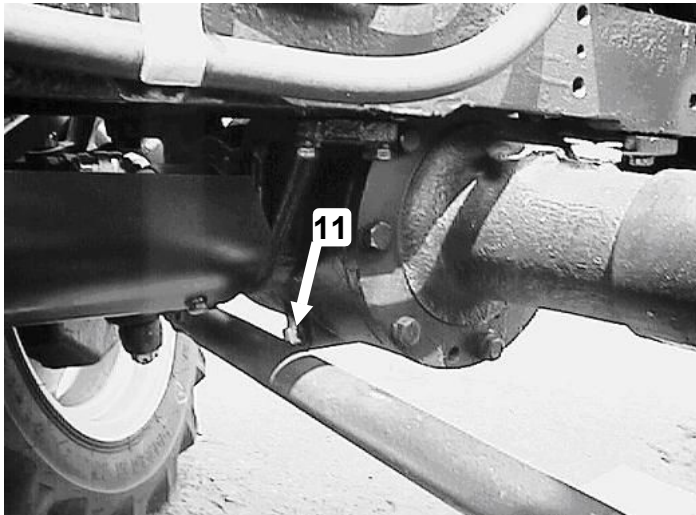


Fig. E-8 Oil drain plug of the front axle (11).

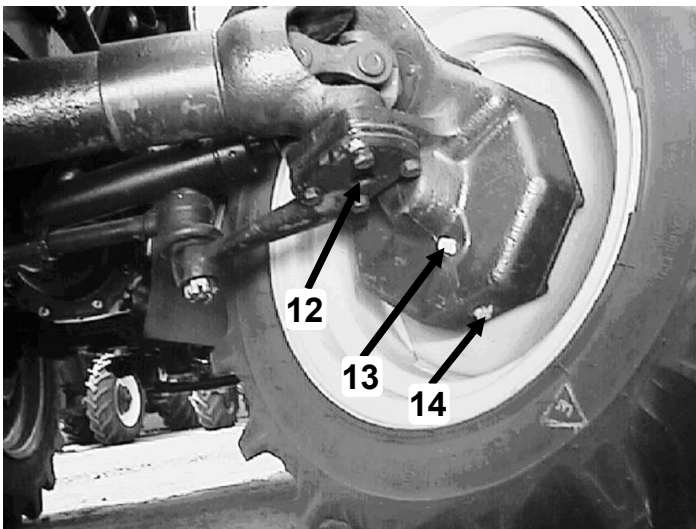


Fig. E-9. Filling/inspection and drain points of the front wheel spur gear drive, lubrication point of the front wheel knuckle. 12- nipple of the knuckle lower bolt; 13- filling/inspection point of the spur gear drive; 14- drain plug .

Front spur gear drives are fitted with following maintenance points:

1. filling/inspection point 13 of spur gear drives (one for each drive) where we fill the gear oil (0,4 dm³).
2. oil drain plugs from both spur gear drives 14
3. upper 10 and lower 12 front wheel knuckle nipples (four nipples). Lubrication consists in performing 4-5 moves with the greaser lever.

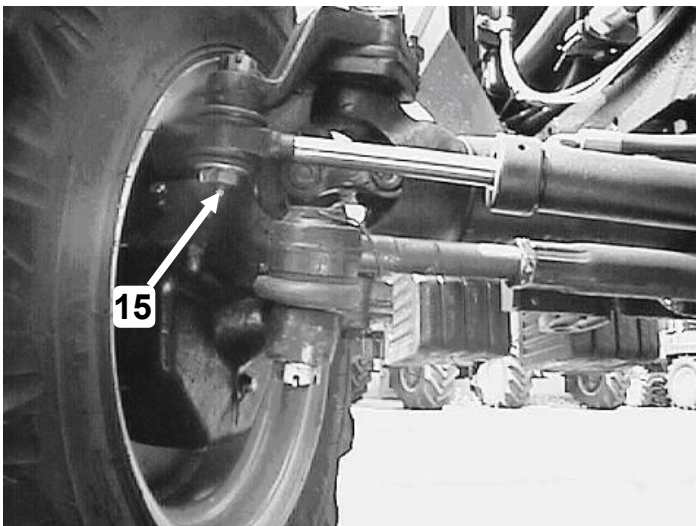


Fig. E-10 Nipple of the steering system cylinder bolt (15)

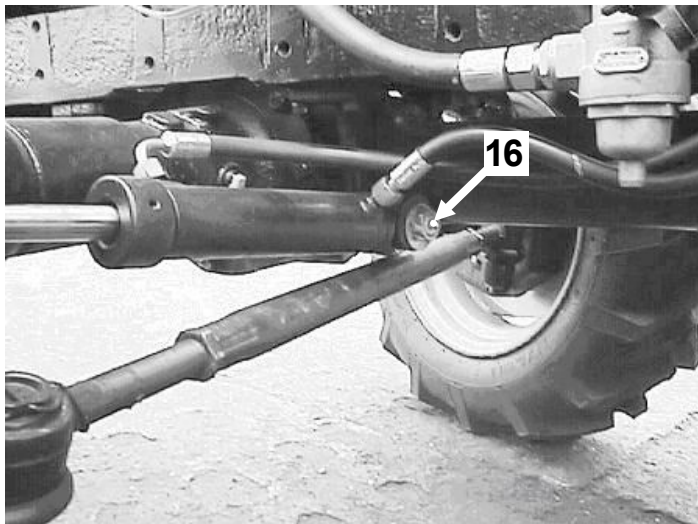


Fig. E-11 Nipple of the steering system cylinder bolt (16)

C. GEARBOX

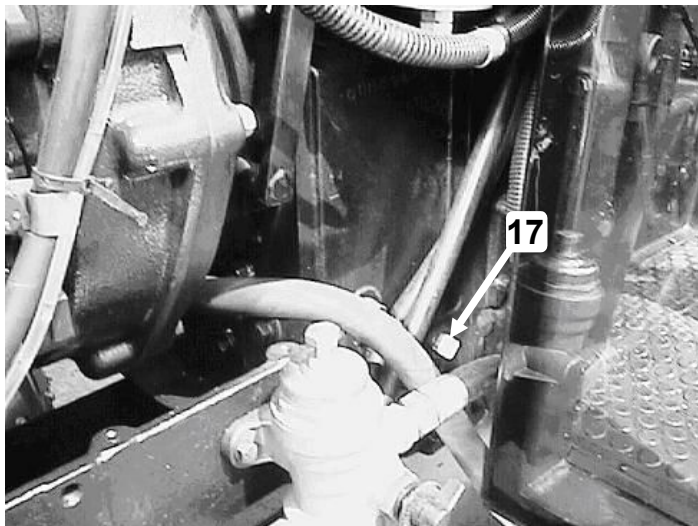


Fig. E-12 Gearbox filling/inspection plug (17).

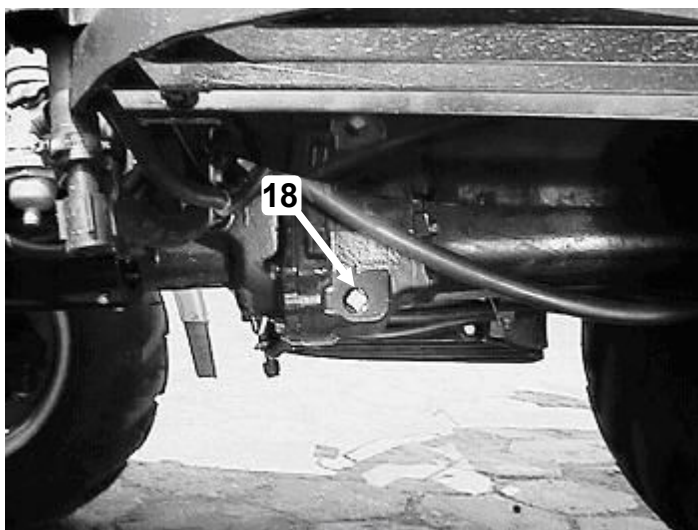


Fig. E-13 Gearbox drain plug (18).

D. RAER DRIVE AXLE AND SPUR GEAR DRIVES OF REAR WHEELS

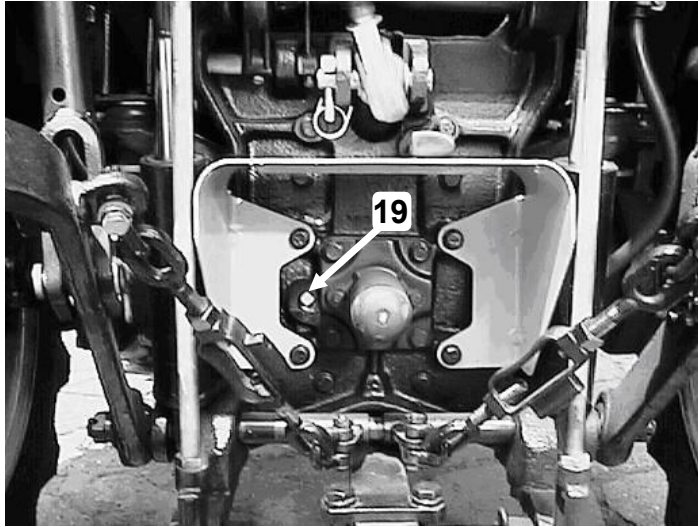


Fig. E-14 Oil filling plug of the rear drive axle 19 (near the rear PTS)

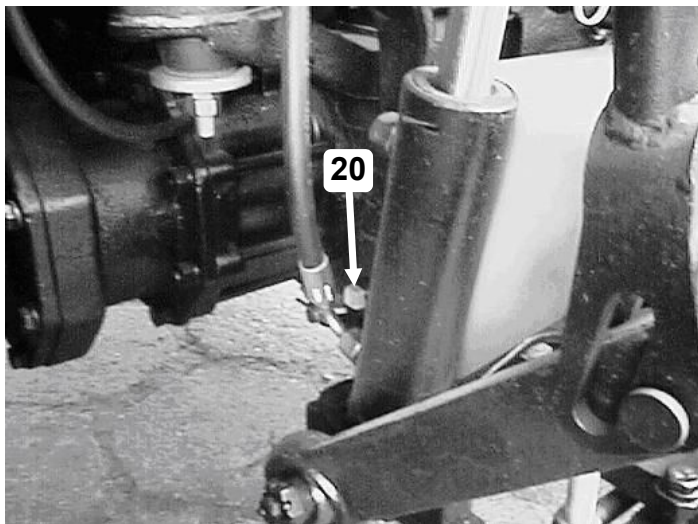


Fig. E-15 Rear drive axle oil drain plug (20).

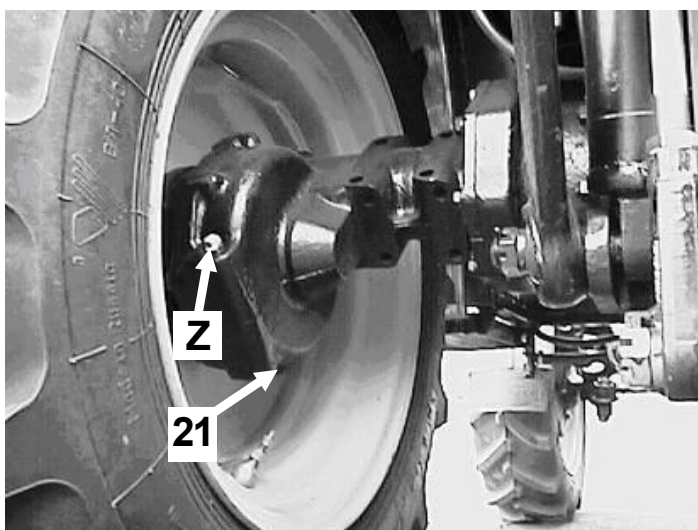


Fig. E-16 Drain plug of the rear axle spur gear drive (21), Z-stopper.

E. REAR SUSPENSION SYSTEM

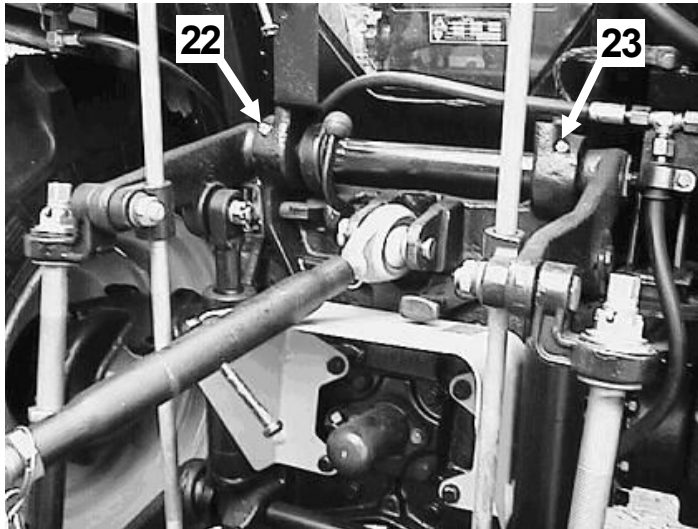


Fig. E-17. RH – two lubrication points 22 and 23- nipples of slide bearings situated in the shaft body of the hydraulic hoist. Lubrication is realised through 4-5 times pushing the greaser lever.

F. HYDRAULIC STEERING SYSTEM



Fig. E-18 Filling plug of the hydraulic & steering system + filling filter.

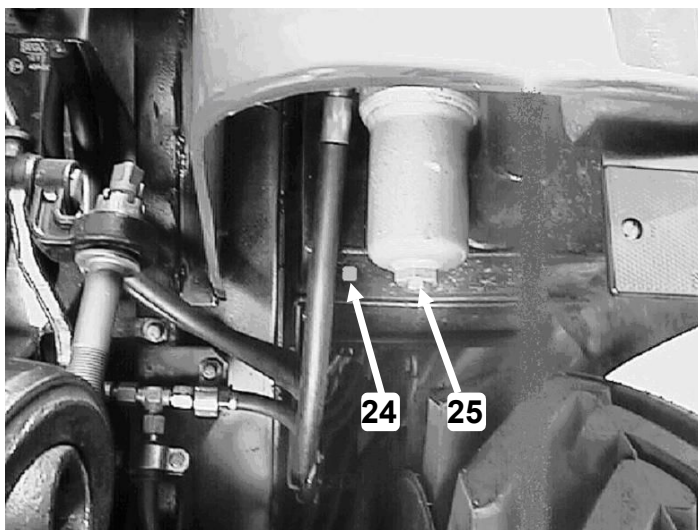


Fig. E-19 Tank drain plug (24) and impurities drain plug (25) of the oil filter.(under the right rear wing).

G. FUEL SYSTEM

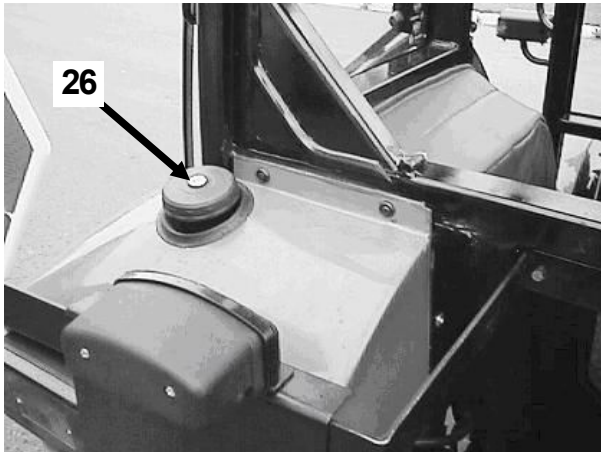


Fig. E-20 Fuel plug (26)- situated near the fuel tank on the left tractor's side just above the rear wheel.

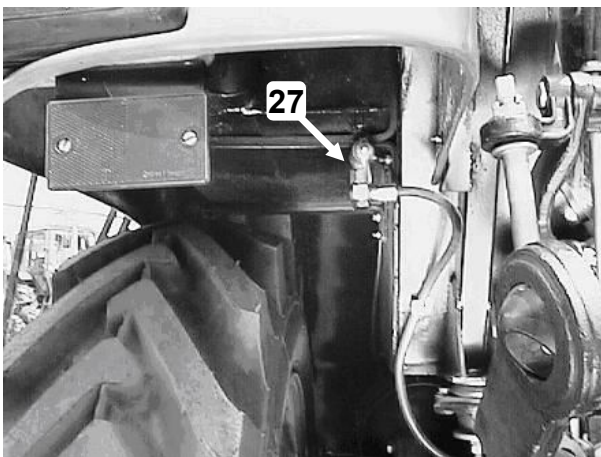


Fig. E-21 Fuel tank valve (27).

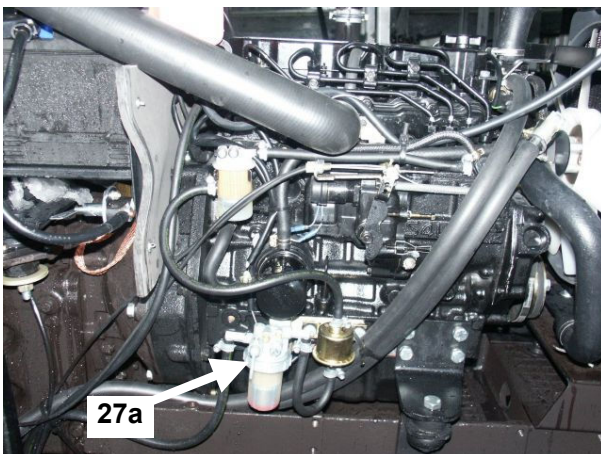


Fig. E-21a Fuel decanter valve (27a).

Do not close the fuel valve after operation for it can cause aeration of the fuel system. Close the tap only if necessary e.g. while replacing the fuel pump or fuel conduit.



WARNING

DO NOT REPLENISH FUEL WHILE THE ENGINE IS ON

H. CAB COOLING & HEATING SYSTEM

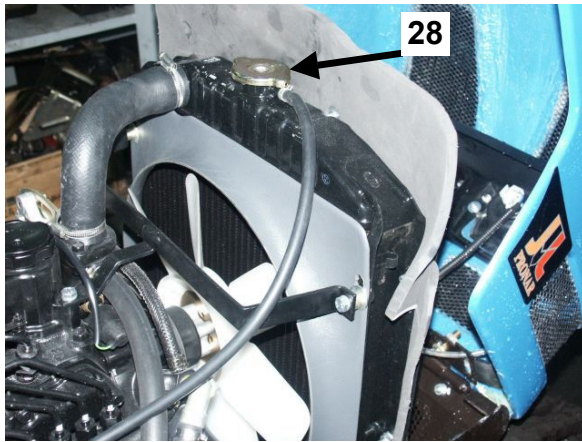


Fig. E-22 Cooler plug (28).

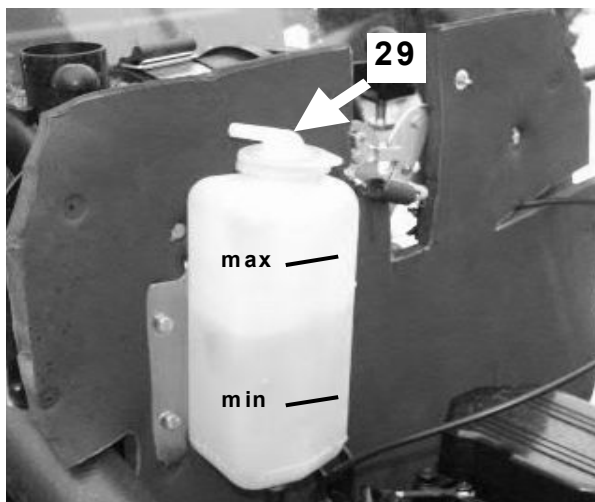


Fig. E-23 Balancing tank plug (29). Keep the coolant level between marks MIN - MAX.

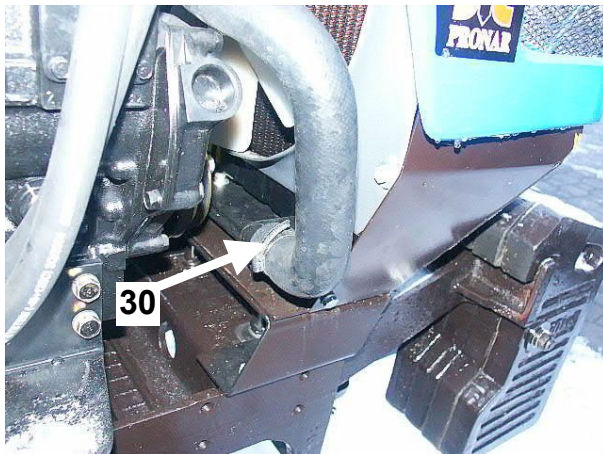


Fig. E-24 Here drain the coolant from the cooler (30).

To drain the coolant first loosen the band clip then remove the rubber pipe from the cooler stub (30) Fig. E-24.



Fig. E-25 Cab heater drain plug (31)- 2 pcs on both sides of the cab

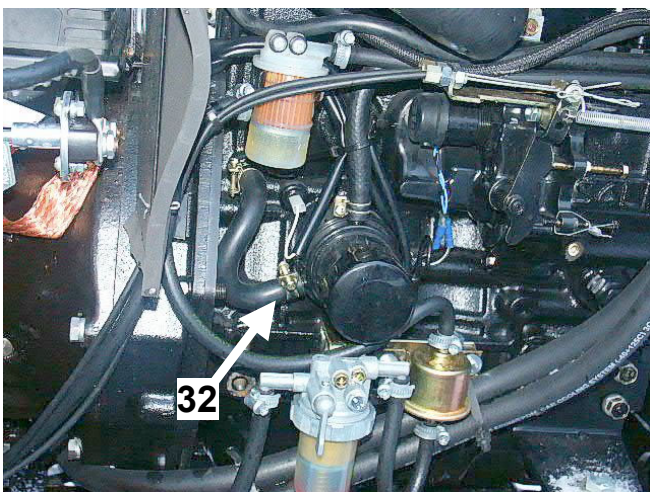


Fig. E-26 Here drain the coolant from the engine block. (32)

To drain the coolant first loosen the band clip then remove the rubber pipe from the stub just by the oil filter (32) Fig. E-26.

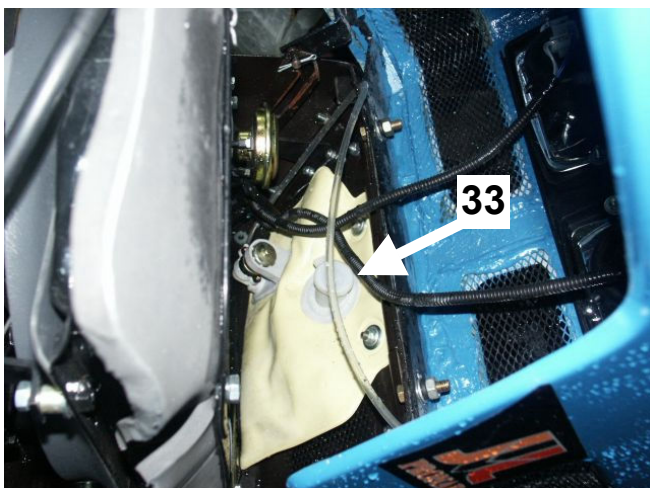


Fig. E-27 Windscreen washer fluid tank (33).

2. RECOMMENDED OILS, GREASES, FUELS

Applied to	Volume in dm ³	Trademark	Notes
Engine - oil sump	5,1	API : CD or higher SAE 15W/40	
Compressor	0,4	API: CD or higher SAE 15W/40	
Hydraulic system (steering, hoist)	19	oil: L- HL32	
Rear drive axle body + spur gear drives	11	API: GL4 or GL5 SAE 80/90	
Gearbox body	3,8	API: GL4 or GL5 SAE 80/90	
Front drive axle + main transmission gear + spur gear drives	3,8 2x0,8=1,6	API: GL4 or GL5 SAE 80/90	
Front PTS body (option)	1,5	API: GL4 or GL5 SAE 80/90	
Hoist shaft, front knuckle bearings etc.	0,1	grease: ŁT-42, ŁT-43	
Cooling system	8	fluid: Borygo, Petrygo	
Fuel tank	32	diesel: DL- summer DZ- winter	acc. to PN-92/C- 96051
PTS clutch (version tractors with PTS clutch)	0,5	API: GL4 or GL5 SAE 80/90	

3. PERIODICAL TECHNICAL INSPECTIONS

Inspection type	Operation No.	Description
Inspection after every 10 mth (before each start-up)	1	Check general engine condition
	2	Check engine & compressor oil level - replenish if necessary
	3	Check fuel level
	4	Check coolant level in the cooler and in the balancing tank - replenish if necessary
	5	Check oil level in the hydraulic & steering tank - replenish if necessary
	6	Check windscreen washer fluid level – replenish if necessary
	7	Check operation of brakes
	8	Remove water condensate from the air reservoir
	9	Check operation of lighting, instrument panel indicators, instruments etc.
	10	Check contamination of the air filter dry insert
Inspection after every 125 mth	11	Clean the filtering element in the primary fuel filter + decanter
	12	Clean fuel tank
	13	Clean cooler ribs (if necessary)
	14	Clean cab air filter, wash if necessary
	15	Clean compressor air filter
	16	Check compressor belt tension
	17	Check technical condition and charging level of the battery - replenish if necessary electrolyte level
	18	Check oil level in the front drive axle and spur gear drives - replenish if necessary
	19	Check gear oil level in the drive transmission system - replenish if necessary
	20	Check clutch pedal lost motion – adjust if necessary
	21	Check full main brake pedal stroke and full parking brake lever stroke
	22	Check tightening of screws of the drive shaft flanges
	23	Check tightening of screws & nuts of wheels – tighten if necessary
	24	Check tyre pressure – adjust if necessary
	25	Remove oil & fuel leakage
	26	Lubricate shafts of arms of the rear (front - option) three-point fastening system
	27	Lubricate bolts of the steering system cylinder
	28	Lubricate bolts of front wheels knuckles

Nazwa przeglądu	Nr operacji	Opis operacji
Inspection after every 250 mth	29	Replace engine oil
	30	Replace compressor oil
	31	Replace engine oil filter
	32	Check condition of engine cooling and cab heating conduits
	33	Check toe-in of front wheels and steering system play – adjust if necessary
	34	Check pneumatic system tightness. Inspect and adjust the brake valve
	35	Clean insert of the dry air filter (replace if necessary)
Inspection after every 500 mth	36	Replace flow fuel filter and filtering element at the fuel decanter
	37	Check play of valves – adjust if necessary
	38	Check differential gear lock – adjust if necessary
	39	Check fan and alternator belt tension - adjust if necessary
	40	Check injection pressure, inspect injectors
	41	Check tightening of cab fastening screws
	42	Check condition of V-belts – replace if necessary
	43	Check and clean engine venting conduit
	44	Check condition of heater plugs
	45	Check condition of compressor valves
Inspection after every 1000 mth	46	Replace coolant (or every 2 years)
	47	Replace steering & hydraulic oil and clean the oil filter insert.
	48	Replace oil in the front axle drive and spur gear drives
	49	Replace oil in the drive transmission system
	50	Replace cab air filter
	51	Check tightening of nuts & screws
	52	Check technical condition of the starter
	53	Check technical condition of the alternator (or yearly)
	54	Clean air reservoir (or yearly)

4. LIST OF WARRANTY INSPECTION OPERATIONS AFTER FIRST 50 MTH

Engine, fuel & cooling systems:

- replace engine & compressor oil,
- replace engine oil filter,
- clean fuel decanter
- check tightness and condition of conduits, band clips etc. in the air supply system,
- tighten screws & nuts

Clutch & brakes:

- check clutch pedal lost motion,
- check adjustment of main and parking brakes.

Drive transmission & hydraulic systems:

- replace gearbox and rear axle oil,
- tighten all external screwed connections,
- check operation of the hydraulic hoist and external hydraulics,
- replace oil in spur gear drives and front drive axle body.

Front axle & steering system:

- replace oil and filter in the hydraulic system,
- check operation of the steering system and steering wheel play.

Wiring system & indicators / gauges:

- check level and density of battery electrolyte, replenish with distilled water,
- check condition of connections at battery terminals,
- check operation of all indicators / gauges and indicator lamps, lights, signalling, wipers, forced air conditioning and cab heating.

Other:

- check operation of the windscreen washer, replenish the fluid,
- clean cab air filter,
- lubricate according to the manual all lubrication points,
- perform tractor driving test and operation of instruments & indicators,
- after the test check if there is oil, fuel and coolant leakage; check the pneumatic system tightness (remove leakage, if necessary)

5. LIST OF DAILY OPERATIONS (OR AFTER PO 10 mth) PERFORMED BY THE USER

1. Check engine, compressor and steering system oil level – replenish if necessary acc. to the manual.

CAUTION:

TRACTOR OPERATION WITH OIL LEVEL BELOW THE LOWER MARK IS PROHIBITED

2. Check compressor belt tension, adjust if necessary.

3. Remove condensate from the pneumatic system tank.

4. Perform visual & auditory inspection of principal units – consists of auditory & visual subjective evaluation of engine operation stability in the whole rpm range.

Steering system elements, steering system, brakes, lighting & signalling system, wipers etc. should be efficient and in proper technical condition. This should be evaluated prior to operating the tractor.

5. Replenish windscreen washer fluid.

6. Clean cooler ribs.

7. Check fastening of all elements of pneumatic & hydraulic systems

8. Check contamination level of the air filter.

CAUTION:

User's obligatory actions are:

1. Tractor washing - (with every generally available washing agents) – before each inspection (P1 -P5).

2. Adjustment of front wheels toe-in after each change of front wheels track.

SEQUENCE OF TECHNICAL INSPECTIONS

INSPECTION No.	P-1	P-G	P-2	P-3	P-2U	P-4	P-2U	P-3	P-2U	P-5	P-2U	P-3	P-2U	P-4	P-2U	P-3	P-2U	P-5
MTH NUMBER FROM THE BEGINNING OF OPERATION	10	50	125	250	375	500	625	750	875	1000	1125	1250	1375	1500	1625	1750	1875	2000

CAUTION:

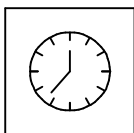
1. The „P-G” inspection (warranty inspection) after 50 mth of tractor's operation and inspections P2, P3, P4, P5, should be performed by the manufacturer's service station.

2. Inspections P-2U are performed by the user

3. The inspection P-2U includes operations of the P-2 inspection.

4. Technical inspections should be performed with mth number tolerance not greater than „+10mth”.

1. ENGINE LUBRICATION SYSTEM



Check engine oil level every 10 mth or daily. Make sure that during inspection the tractor is standing on the level ground.

Engine oil and oil filter replacement according to manufacturer recommendations – every 250 mth for the MITSUBISHI S4L2 engine.



WARNING

KEEP SAFETY MEASURES – HOT OIL MAY CAUSE SCALDS!

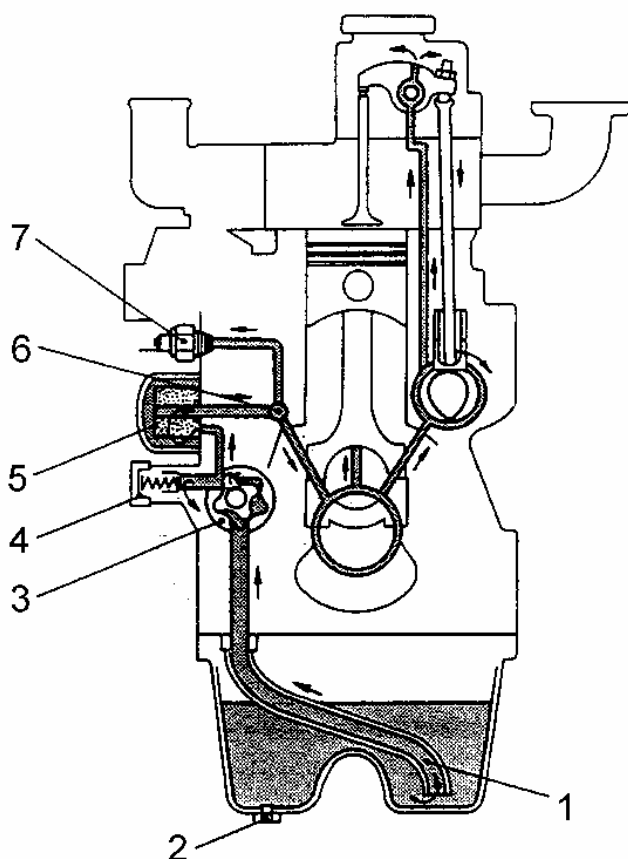


Fig. F-1: Oil lubrication system MITSUBISHI 1503

1- sucking sieve filter; 2- drain plug; 3- oil pump; 4- safety valve; 5- oil filter; 6- main oil conduit.; 7- oil pressure sensor;

Replace the oil just after end of operation when the engine is still hot and perform following operations:

- position the tractor on the level ground
- remove the drain plug (2) from the oil sump (Fig. F-1), drain the oil completely and screw the plug
- fill the oil sump with proper pure oil so that its level stand between „L” and „H” marks at the dipstick (Fig. E-5).

It is recommended to use oil types given in the manual; pay special attention to oil purity.

Filter replacement:

- remove contaminated filter (POS. 5, Fig. F-1)
- lubricate sealing ring of the new filter with a few drops of oil
- screw new filter in until the sealing ring comes into contact with the body, then tighten manually by turning the filter half a turn more (do not tighten to hard)

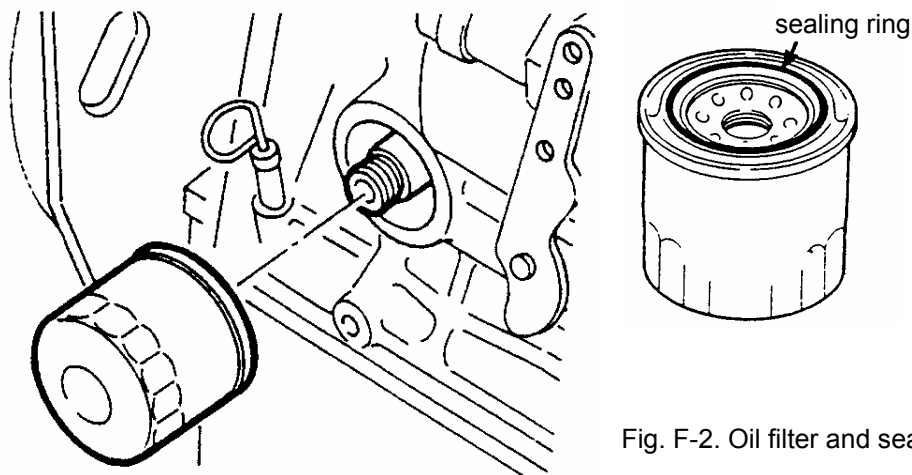


Fig. F-2. Oil filter and sealing ring.

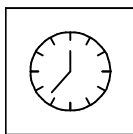


CAUTION:

WHILE UNSCREWING THE OIL FILTER DO NOT USE A HAMMER, CHISEL ETC. FOR IT MAY CAUSE DAMAGE OF FILTER BODY OR ENGINE BLOCK. USE ONLY FILTERS RECOMMENDED BY THE ENGINE MANUFACTURER (ORIGINAL).

After oil replacement start the engine, check if there is no leakage, check oil level and replenish, if necessary.

2. TIMING GEAR



Check valve play and adjust every 500 mth in the MITSUBISHI S4L2 engine.

If you have general idea about how to adjust valves you can do it single-handed using following operation algorithm. Prior to adjustment raise the bonnet and disassembly the cylinder block head cover.

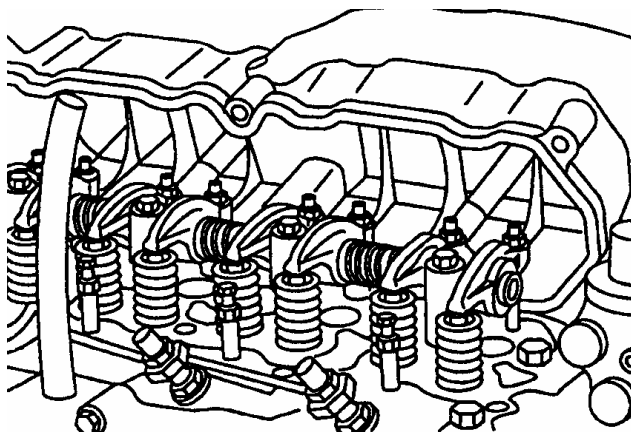


Fig. F-3. Disassembly of the head cover of the MITSUBISHI engine cylinder block

Adjustment of the valve play in the MITSUBISHI S4L2 engine:

After every tightening of the engine head check the valve play. The play between the valve and the valve lever should be checked (measured) with a gap gauge. For both inlet and outlet valves the play is the same and amounts to 0,25 mm while the engine is cold. The adjustment should be performed separately for each cylinder in the GMP position after the compression stroke. Finish the adjustment tightening the counter-nut .

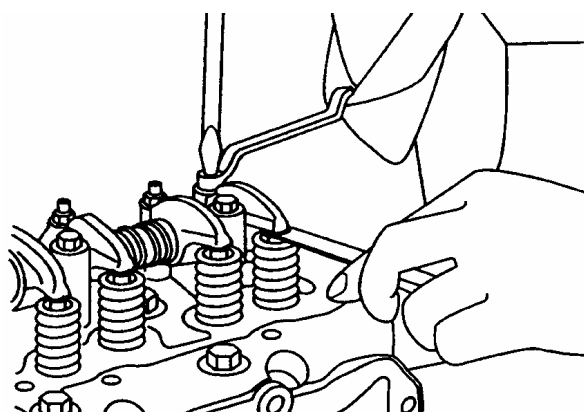


Fig.F-4. Valve play of the MITSUBISHI engine

CAUTION:

1. PRIOR TO VALVE PLAY ADJUSTMENT WAIT TWO HOURS TILL THE ENGINE COOLS DOWN.
2. ACCURATE VALVE PLAY ADJUSTMENT IS POSSIBLE ONLY AT AN ASS FOR ITS REQUIRED ACCURACY AMOUNTS 0,01 MM.

3. FUEL SYSTEM

- Pay highest attention to the purity of used fuel and observe strictly recommended periods of fuel system maintenance. As for fuel storage see: „TRACTOR & FUEL STORAGE”

The fuel is sucked in by the supply pump **2** and – through the valve and the fuel filter with decanter **1** – pumped to the injection pump **7** from where it is supplied under pressure to the injectors **4**. Excess of fuel goes back from injectors through the fuel feedback conduit **5** to the tank.

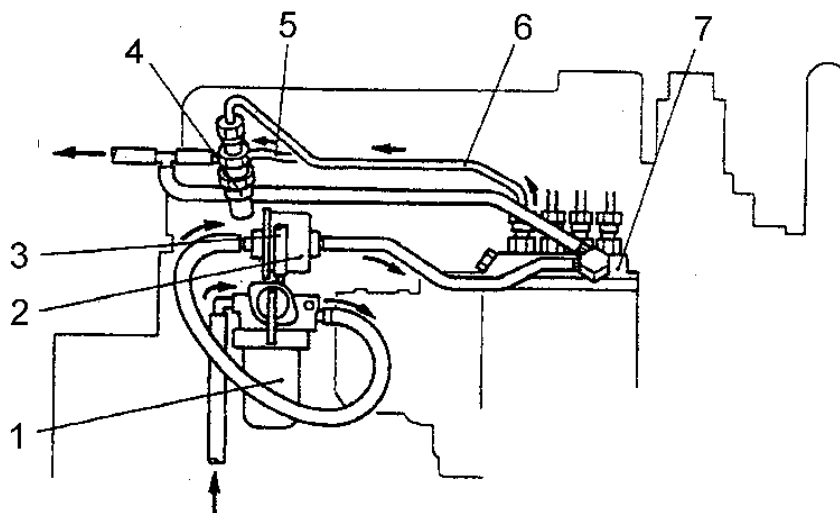
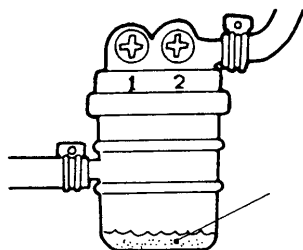


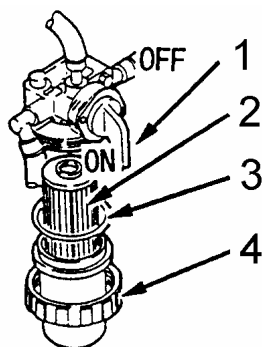
Fig.F-5. Fuel of the MITSUBISHI S4L2 engine
1-fuel filter + decanter; 2- supply pump; 3- fuel flow filter; 4- injectors; 5- flexible feedback conduit; 6- rigid HP conduit; 7- injection pump.

Fuel filter



The fuel flow filter for fine cleaning is situated between the supply pump and the injection pump. Replace it every 500 mth.

Fig. F-6. Fuel flow filter.



While replacing the filtering element **2** (Fig. F-7), set the valve **1** to OFF.

CAUTION: Remove water and impurities from the decanter, if necessary.

Clean the filtering element **2** every 125 mth and replace it every 500 mth.

Fig. F-7. Filter with fuel decanter of the MITSUBISHI S4L2 engine
1- valve; 2- filtering element; 3- sealing ring; 4- nut

CAUTION:

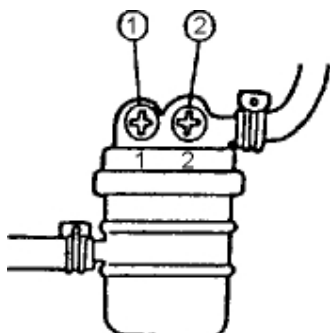
After each filter replacement / cleaning vent the fuel system.

FUEL SYSTEM DEAERATION



CAUTION

We can perform the fuel system deaeration by switching on the electric fuel pump (POS.2, Fig. F-5), i.e. turning the ignition key to **1** (str. 17; rys C-2)



To vent the fuel system:

- 1- loosen the screw **1** (Fig. F-8) on the fuel flow filter.
- 2- wait until flowing out fuel will be free of air bubbles.
- 3- tighten the screw **1**

repeat the same operation with the screw **2**.

Fig.F-8 Venting screws on the flow filter for fine fuel cleaning.

4. ENGINE AIR FILTER (Fig. F-13)

The air is cleaned with the filter fitted with a shielded paper insert. The filter cover **2** is fitted with a rubber valve for removing of larger particles of impurities. Inside the shield there is the filtering insert **4**, which prevents dust or small impurities from penetrating the engine.

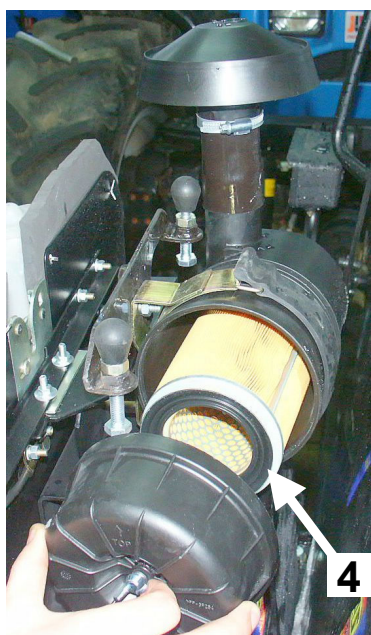
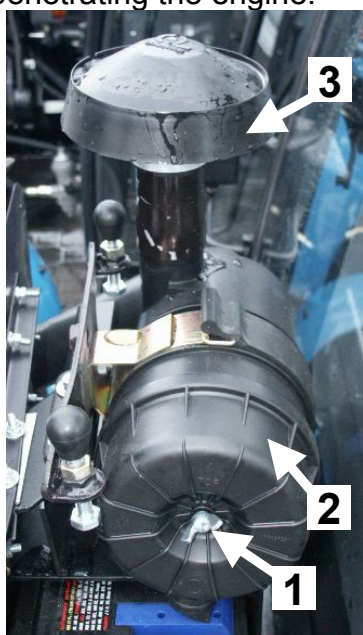
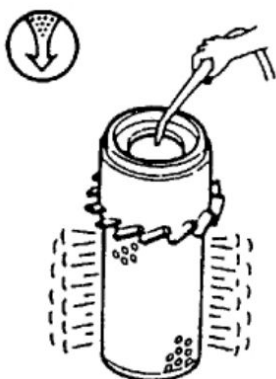


Fig. F-13 Air filter with a dry filtering insert.
1- butterfly nut; 2- cover; 3- air inlet guard; 4- filtering element.

CAUTION:

Clean the filter insert every 250 mth.



Replace the filtering insert if it is very contaminated and impurities cannot be removed with compressed air. Period between subsequent replacements depends on operation environment conditions. It is recommended to after every 6 cleanings but not rarer than once a year or if there are even small breaks or holes on the insert surface.

Fig. F-14 Filter cleaning with compressed air

5. COOLING SYSTEM OF THE PRONAR-320AM TRACTOR

The cooling system of the MITSUBISHI engine is a closed overpressure system, with forced coolant circulation.

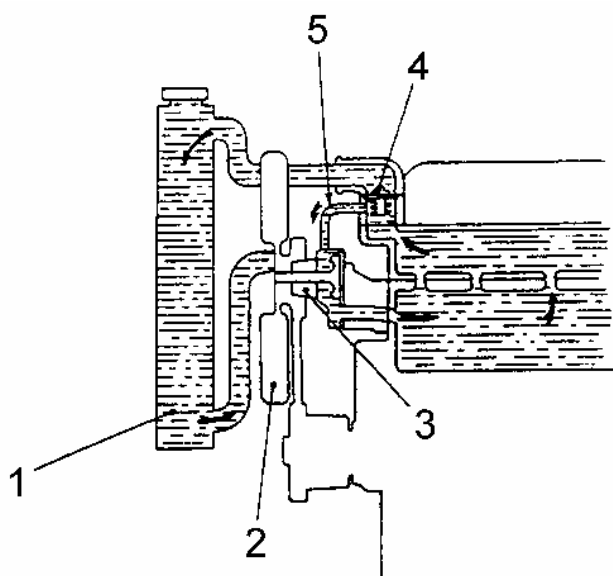
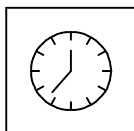


Fig. F-15. Cooling system of the MITSUBISHI engine
1- cooler; 2- fan; 3- coolant pump; 4- thermostat; 5- overfall conduit



Check the coolant level every 10 mth or once a day. Replace the coolant every 1000 mth or every 2 years. **The MITSUBISHI engine cooling system is factory filled with BORYGO fluid.**



WARNING

If the engine is hot loosen the cooler plug slowly and cautiously to equalise the pressure gradually.

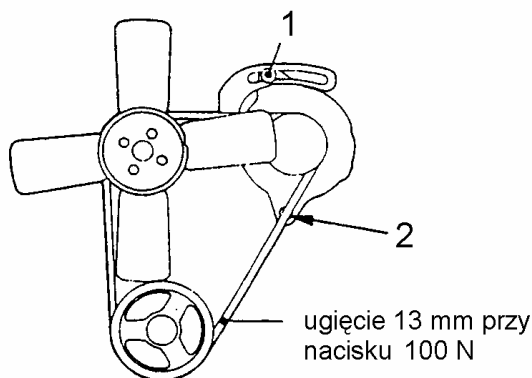
Keep the cooler ribs clean to ensure proper intensive cooling.

To drain the coolant from the cooling system first unscrew the cooler plug 28 (Fig. E-22), then loosen the band and remove the rubber pipe for piping off the water from the cooler 30 (Fig. E-24), loosen the band and remove the rubber pipe for piping off the water from the engine block 32 (Fig. E-26), and unscrew the drain plugs of the cab heater 31 (Fig. E-25). Having the fluid drained reinstall all pipes and fill the system with recommended coolant, start-up the tractor for a few minutes and replenish the coolant up to required level (Fig. E-23)

CAUTION:

- TO PROTECT ENGINE & SYSTEM AGAINST DAMAGE USE ONLY ANTIFREEZE FLUIDS: „BORYGO” - red - OR „PETRYGO” - blue.
- OBSERVE RECOMMENDATIONS OF FLUID MANUFACTURER.
- **DO NOT USE WATER FOR ENGINE COOLING, ESPECIALLY WHEN THE TEMPERATURE FALLS BELOW °C.**

Adjustment of the fan drive V-belt tension.



To adjust the fan V-belt tension first loosen the screws 1 i 2, then by turning the alternator round the screw 2 adjust proper V-belt tension, tighten the screw 1, and finally the screw 2.

Fig. F-16. Fan and V-belt tension of the MITSUBISHI engine
1- tension adjustment screw; 2- alternator fastening screw

BELT DEFLECTION VALUE CA. 13 MM WHEN PRESSED WITH FORCE OF CA. 100 N.

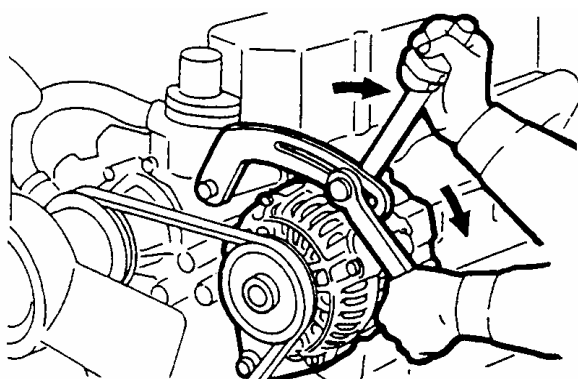


Fig. F-17. Adjustment of the fan V-belt tension

6. DRIVE & POWER TRANSMISSION UNITS

The basic maintenance of drive & power transmission units is limited in principle to checking, replenishment and replacement of oil. The scope of maintenance includes also replacement of damaged or worn sealings of said units.

CAUTION:

IF THE OIL LEVEL IS TOO LOW REPLENISH IT UP TO THE RECOMMENDED VOLUME; CLEAN ALL EXTERNAL SURFACES AND CHECK IF THERE IS ANY LEAKAGE.

NEGLIGENCE IN FINDING LEAKAGE OR IN REMOVING THE FAILURE MAY LEAD TO:

1. QUICK WEAR OF PARTS OR UNITS.
2. TRACTOR DAMAGE.
3. LOSS OF WARRANTY.

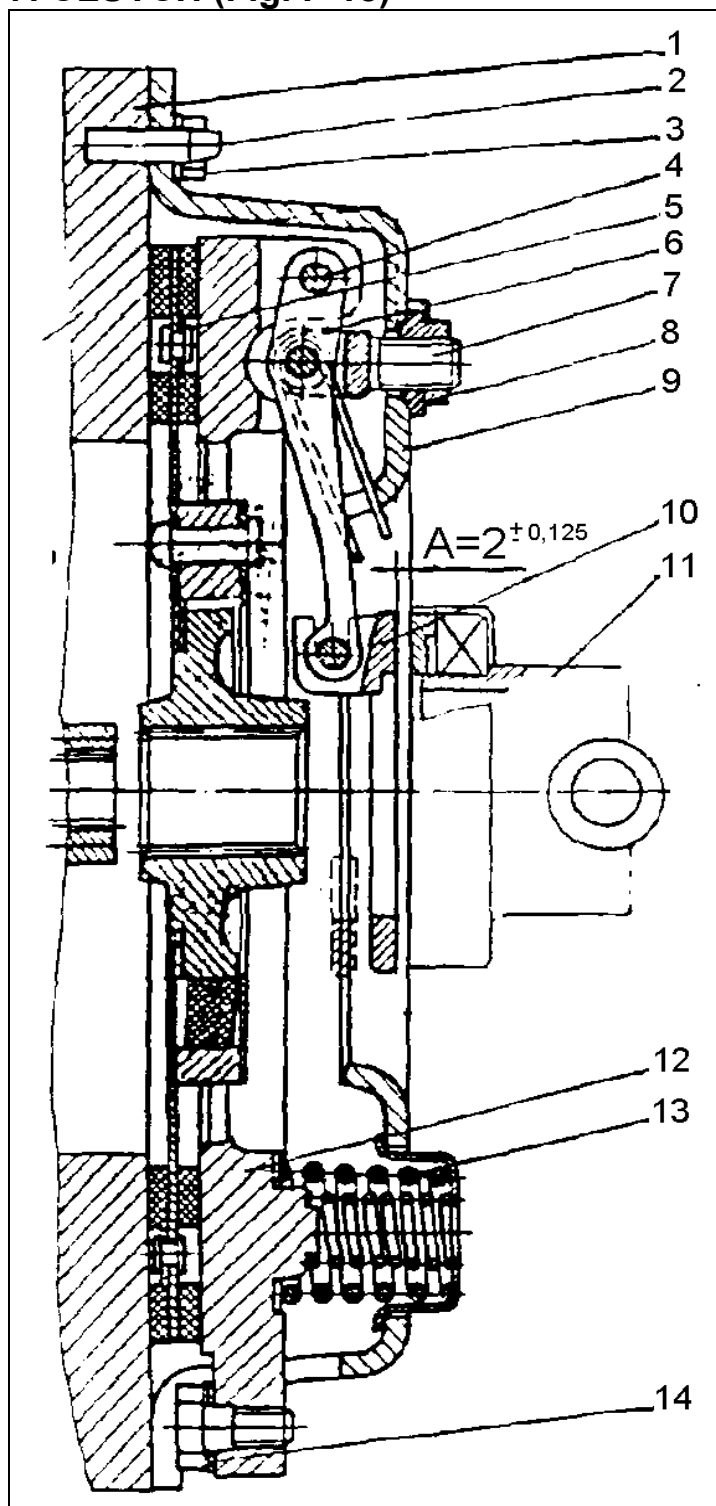
CAUTION:

1. IF YOU FIND ANY TRACES OF LEAKAGE (FATTED EXTERNAL SURFACES, EXCESSIVE OIL LOSS IN GEARBOX, OIL SUMP ETC.) LOCALISE THE PLACE OF LEAKAGE BY CHECKING ALL SEALINGS.
2. AFTER EACH DISASSEMBLY REPLACE SEALS BETWEEN DISCONNECTABLE SURFACES.
3. EFFICIENT OPERATION OF ALL COMPONENTS OF THE DRIVE UNIT DEPENDS ON PROPER OIL VOLUME DEFINED WITH ITS LEVEL – MEASURED AFTER

TRACTOR COOLING DOWN. REPLENISHMENT CONSISTS IN FILLING THE OIL UP TO THE EDGE OF THE INSPECTION OR FILLING/INSPECTION PLUG OF RELEVANT UNIT.

4. WE RECOMMEND TO DRAIN THE OIL JUST AFTER OPERATION WHEN THE ENGINE IS STILL HOT.

7. CLUTCH (Fig. F-18)



Structure

The tractor is fitted with a single-disc friction closed clutch. The clutch is fastened to the flywheel with 3 screws on 3 guiding pins 2.

The engine flywheel torque and the torque of the pressure disc 12 connected with the clutch cover 9 with flat springs is transferred to the clutch disc 5 and further to the clutch shaft of the gearbox. Between the pressure shield and the clamp cover there are nine springs 13.

Clutch disengaging is realised with help of three releasing levers 6 connected with bolts 4 to the pressure shield and supported through fork 7 and adjustment nuts 8 to the clamp housing.

Fig. F-18. Clutch.

1- engine flywheel; 2- pin; 3- screw; 4- bolt; 5- clutch disc; 6- pressure lever; 7- fork; 8- adjustment nut; 9- clutch cover; 10- release ring; 11- releaser; 12- pressure shield; 13- springs; 14- flat springs.

Clutch pedal adjustment.

The lost motion of the clutch pedal as measured on the footrest should be within the range 38-51mm. Clutch pedal motion in the whole range should be smooth and without jams.

The clutch should be adjusted as follows::

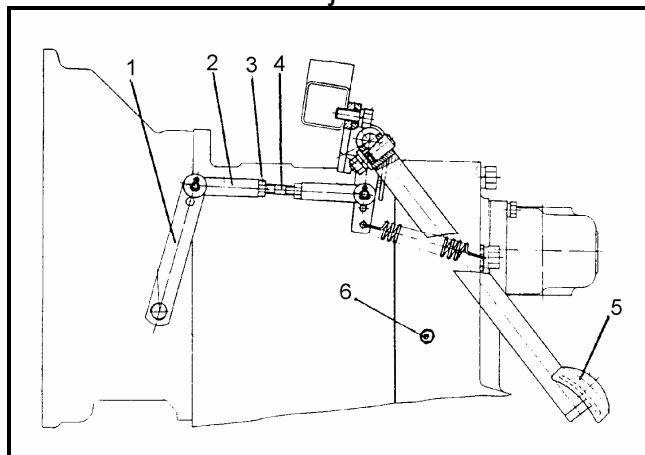


Fig. F-19.

- 1- clutch lever;
- 2 - fork;
- 3 - counter-nut;
- 4 - pull rod;
- 5 - clutch pedal
- 6 - clutch pedal stroke limiter

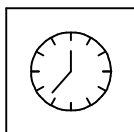
1. Unlock the bolt of the clutch pedal lever assembly (Fig. F-19).
2. By removing the bolt disconnect the clutch pull rod 4 and the lever 1.
3. Turn the lever 1 to the position "clutch pressed" by turning it left as far as it will go (to the bearing).
4. Turn the fork 2 until the openings of the lever 1 and the fork 2 agree.
5. Turn the fork 2 4-5 times and connect it with the bolt to the lever 1.
6. Protect the fork 2 against unscrewing with the counter-nut 3.
7. Protect the bolt against falling out with a cotter pin.
8. Check the clutch pedal lost motion and if outside range of 38-51 [mm] – repeat actions 1-7 once again.

CAUTION:

IF THE LOST MOTION ADJUSTMENT APPEARS TO BE IMPOSSIBLE (E.G. AFTER A FEW TRIALS) CALL THE NEXT ASS OR YOUR DEALER.

CAUTION:

1. WHILE DRIVING THE TRACTOR DO NOT REST THE FOOT ON THE CLUTCH PEDAL.
2. WHILE DRIVING DO NOT SWITCH OVER THE GEARBOX LEVER, THE REDUCTION GEAR AND THE PTS LEVER WITHOUT PRESSING THE CLUTCH PEDAL.
3. DO NOT DRIVE DOWNHILL HAVING THE CLUTCH PEDAL PRESSED DOWN.
4. DO NOT NEGLECT AND DISREGARD THE CLUTCH ADJUSTMENT FOR IT MAY CAUSE PREMATURE WEAR OR DAMAGE OF THE CLUTCH.



During first 50 hrs check the clutch pedal lost motion systematically and adjust immediately if necessary.

After the running-in period check and adjust the lost motion – if necessary – every 125 mth.

8. GERABOX (Fig. F-20)

Structure

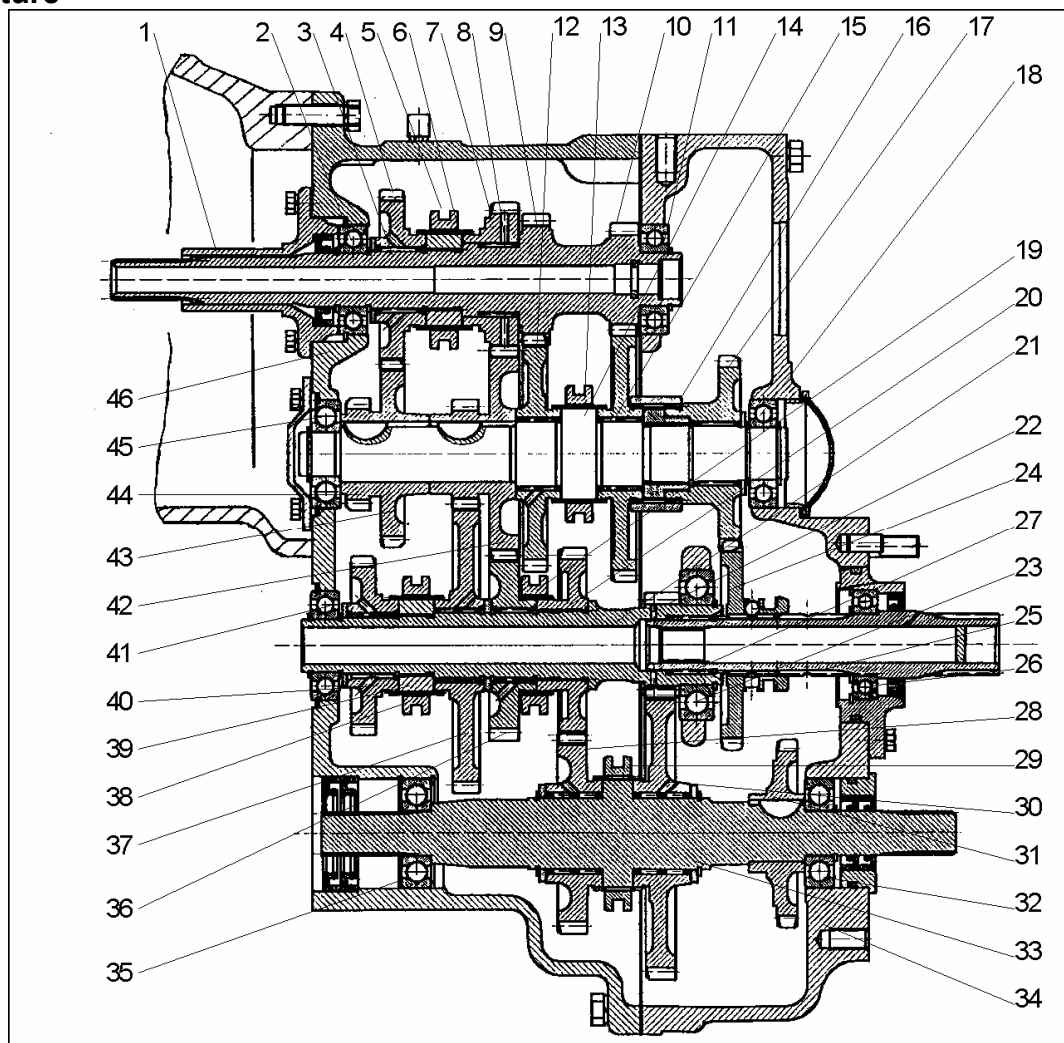


Fig. F-20. Gearbox.

- | | |
|---|--|
| 1. clutch shaft | 24. toothed gear, PTS drive |
| 2. ball bearing | 25. drive shaft PTS |
| 3. needle bearing | 26. ball bearing |
| 4. toothed gear, IV. gear (driving) | 27. needle bearing |
| 5. sleeve | 28. toothed gear (driven), decelerating reduction unit |
| 6. tooth clutch | 29. tooth clutch |
| 7. toothed gear, III. gear (driving) | 30. toothed gear (driven), accelerating reduction unit |
| 8. needle bearing | 31. toothed gear, dependent PTS drive |
| 9. toothed ring, II. gear (driving) | 32. ball bearing |
| 10. toothed ring, I. gear (driving) | 33. gearbox output shaft |
| 11. ball bearing | 34. gearbox body |
| 12. toothed gear, II. gear (driven) | 35. ball bearing |
| 13. tooth clutch | 36. toothed gear (driven), II. range |
| 14. first intermediate shaft | 37. toothed gear (driven), I. range |
| 15. toothed gear, I. gear (driven) | 38. tooth clutch |
| 16. sleeve | 39. sleeve |
| 17. toothed gear, PTS drive | 40. toothed gear (driven), rear gears |
| 18. ball bearing | 41. ball bearing |
| 19. tooth clutch | 42. toothed gear |
| 20. toothed gear | 43. toothed gear (driven), IV. gear |
| 21. second intermediate shaft | 44. toothed gear (driving), rear gears |
| 22. toothed ring, reduction unit (decelerating) | 45. ball bearing |
| 23. ball bearing | 46. gearbox front body |

The tractor is fitted with a mechanical, multi-staged, three-range (two ranges forward + one rearward); gears and gear ranges are selected with tooth clutches.

The gearbox allows to select one of 16 transmission ratios forward and 8 transmission ratios rearward (with help of the reduction gear), transmits drive to the front axle and the hydraulic pump and also drives both dependent and independent rear PTS.

The gearbox consists of two bodies 34,46, clutch shaft 1, first and second intermediate shaft 14 i 21, PTS drive shaft 25, output shaft 33, and toothed gears, tooth clutches for gear switchover and the control gear. The clutch shaft 1 is supported in gearbox bodies with two ball bearings 2,11. The shaft is fitted with two toothed discs 10 i 9 for I. and II. gears. Additionally, on the clutch shaft are seated toothed gears 7 i 4 for III. and IV. gears, and also the tooth clutch for switching on III. and IV. gears (on the shaft splines). The first intermediate shaft 14 is supported with two ball bearings 18 i 45. On the shaft keys are seated firmly toothed gears 42 and 43, and on needle bearings – toothed wheels for II. - 12 and I. gear - 15. Additionally, on the shaft is seated firmly the PTS drive toothed wheel 17 connected via the sleeve 16 with the toothed wheel 15, and also fixed to the shaft tooth clutch 13 for switchover of I. and II. gears.

The second intermediate shaft 21 is fitted with the toothed ring 22 of the decelerating reduction gear. The shaft is supported with two ball bearings 23 i 41. On the shaft are seated: the rear gear toothed wheel 40 (on needle bearings), the I. gear range toothed wheel (driven) 37, the II. gear range toothed wheel (driven) 36 and toothed clutches 19.

The front end of the PTS drive shaft 25 is supported with a needle bearing within the second intermediate shaft, the rear end – with the ball bearing 26 in the body 34. On the splines of the shaft 25 is seated shiftable PTS drive toothed wheel 24. The rear PTS is driven from the rear shaft end splines and the front PTS – from shaft keys.

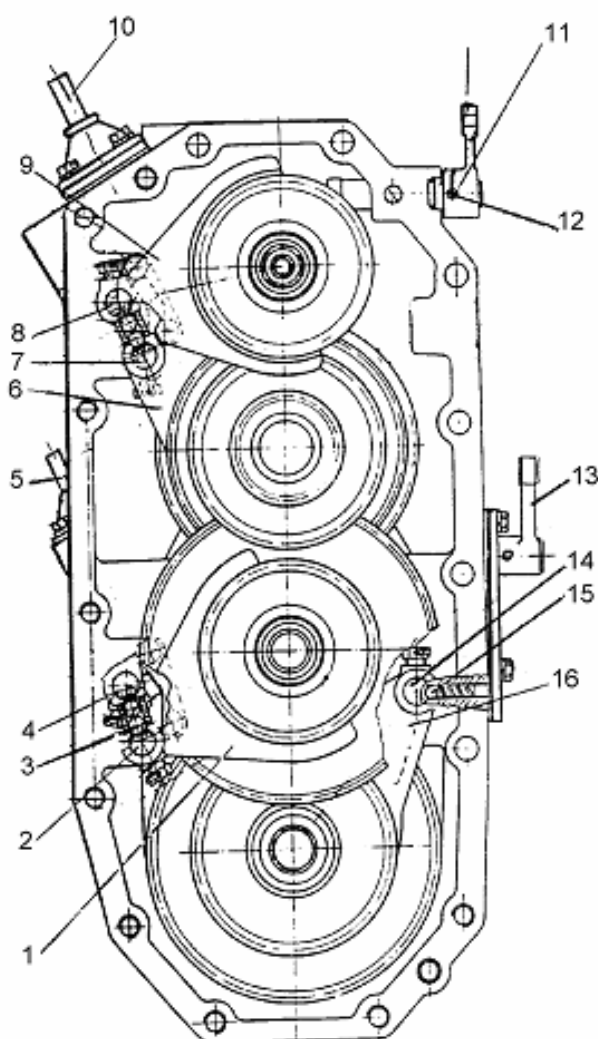
The output shaft 33 is seated on ball bearings 32 and 35. On the shaft, on needle bearings, are seated driven toothed wheels 28 of the accelerating reduction gear, tooth clutch 29 of the reduction gear switchover, and also the toothed wheel 31 of the dependent PTS drive seated unshiftable on the shaft with help of splines. External splines of the shaft 33 are driven front and rear drive axles.

Gearbox control (Fig. F-21)

The changeover of the gears I., II., III., and IV. is realised with the lever 10 (Fig. F-21), which through the shifters 7, 8 operates forks 6 and 9 mounted to the shifters with screws; the forks dislocate tooth clutches 6,13 (Fig. F-20) seated on shaft splines 1, 14. Gear range switchover (two ranges forward and one rearward) is realised with help of the lever 5 (Fig. F-21), which through the shifters 2, 4 operates forks mounted to the shifters with screws; the forks dislocate tooth clutches 19, 38 (Fig. F-20). The I. forward gear range and rear gear range are switched on with the tooth clutch 38. The II. forward gear range is switched on with the tooth clutch 19.

PTS drive switchover (dependent / independent) is realised with the lever 13 (Fig. F-21), which operates the toothed wheel 24 (Fig. F-20) causing its shift to one of three possible positions:

- front (left on the diagram) meshed with the wheel 17 - independent PTS drive on
- rear (right on the diagram) meshed with the wheel 31 - dependent PTS drive on
- middle - neutral PTS drive on.



Switchover of the gear reduction unit is performed with the shifter 14 (Fig. F-21) fitted with forks 16, which shift the tooth clutch 29 (Fig. F-20), switching on accelerating (left position of the toothed clutch) or decelerating reduction gear transmission ratio.

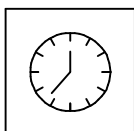
Switching on the hydraulic pump is realised with the lever 11 (Fig.F-21). Operational and neutral positions of toothed wheels & clutches are set with ball clamps 15 (Fig.F-21). To avoid simultaneous activation of two tooth clutches 6,13 and 19,38 the gearbox is fitted with locking units with balls 3 (Fig. F-21).

Fig. F-21. Gearbox control.

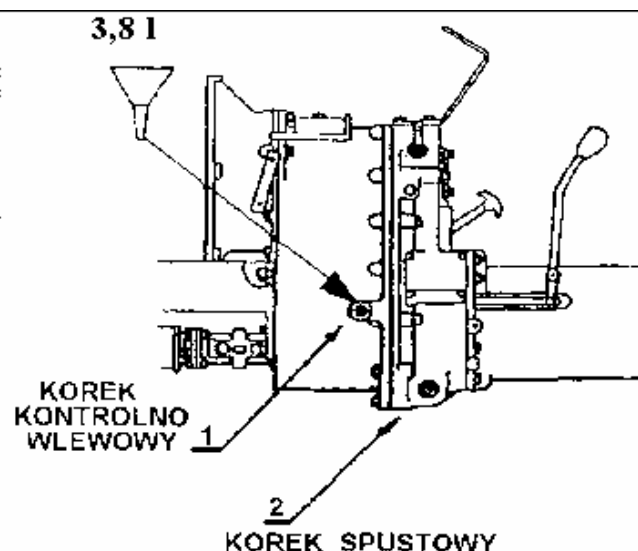
1- fork; 2, 4- shifters; 3- ball; 5- gear range selection lever; 6, 9- forks; 7, 8- shifters; 10- gear change lever; 11- hydraulic pump switch lever; 12- pin; 13- PTS drives switch on lever; 14- shifter; 15- ball catch; 16- fork

Gearbox operation

- While operating the tractor choose the gear, which allows to obtain lowest possible fuel consumption without engine or drive transmission overload. Do not forget that soil conditions may change on the same field even every few meters, thus select such gear so that the engine works at 3/4 maximum power.
- While operating the tractor avoid driving with partially pressed clutch pedal for it may cause overheating or destruction of the clutch.



CHECK THE GEAR OIL LEVEL IN THE GEARBOX AND IN THE REAR AXLE EVERY 125 MTH OR 6 MONTHS. REPLACE OIL IN THE GEARBOX AND IN THE REAR AXLE EVERY 1000 MTH OR TWO YEARS.



To replace gearbox oil first unscrew plugs 1,2 when the engine is still hot and wait until the used oil trickles down to a tub (stops to drop). Tighten the plug 2 pour 3,8 l gear oil through the opening 1.

Fig. F-22. Gearbox. Maintenance points
1- inspection / filling plug;
2- drain plug.

9. REAR DRIVE AXLE (Fig. F-23, F-24)

The rear drive axle transmits the torque from the gearbox to rear wheels. The axle consists of the main transmission of the differential gear, mechanical lock of the differential gear, spur gear drives and brakes.

Main transmission unit

Structure

The unit transmits torque from the gearbox to the rear axle differential gear. The unit consists of sleeve 5 (Fig. F-23), shaft 53, tooth clutch 47, toothed sleeve 44, pinion 33 supported with conical bearings 34 and crown wheel 36 (Fig. F-24) fixed with screws 34 to the differential gear body.

Adjustment

Axial play of conical bearings should be in the range 0,01 to 0,04 mm and is adjusted through selection of suitable spacers 40. The torque required for turning the shaft 33 together with bearings should amount to 1,0...1,2 Nm. Nut tightening torque 45 - 120...150 Nm.

During assembly of the shaft 33 with bearings pay attention to the „E” dimension, which amounts to $59,5^{+0,19}$ mm and can be adjusted with washers 36,37.

Side play between teeth in the main transmission gear should amount to 0,08...0,22 mm, and the tooth mesh surface should be not less than 50%. Point of teeth contact should be situated in the central part of a tooth or closer to the upper part of the cone. Play adjustment is realised by moving part of washers 33,34 (Fig. F-24) from under the body flange of the left brake 31 under the body flange 49 of the right brake without changing total number of washers.

Caution: Side play adjustment in the main transmission unit should be performed only after adjustment of play in conical bearings of the differential gear.

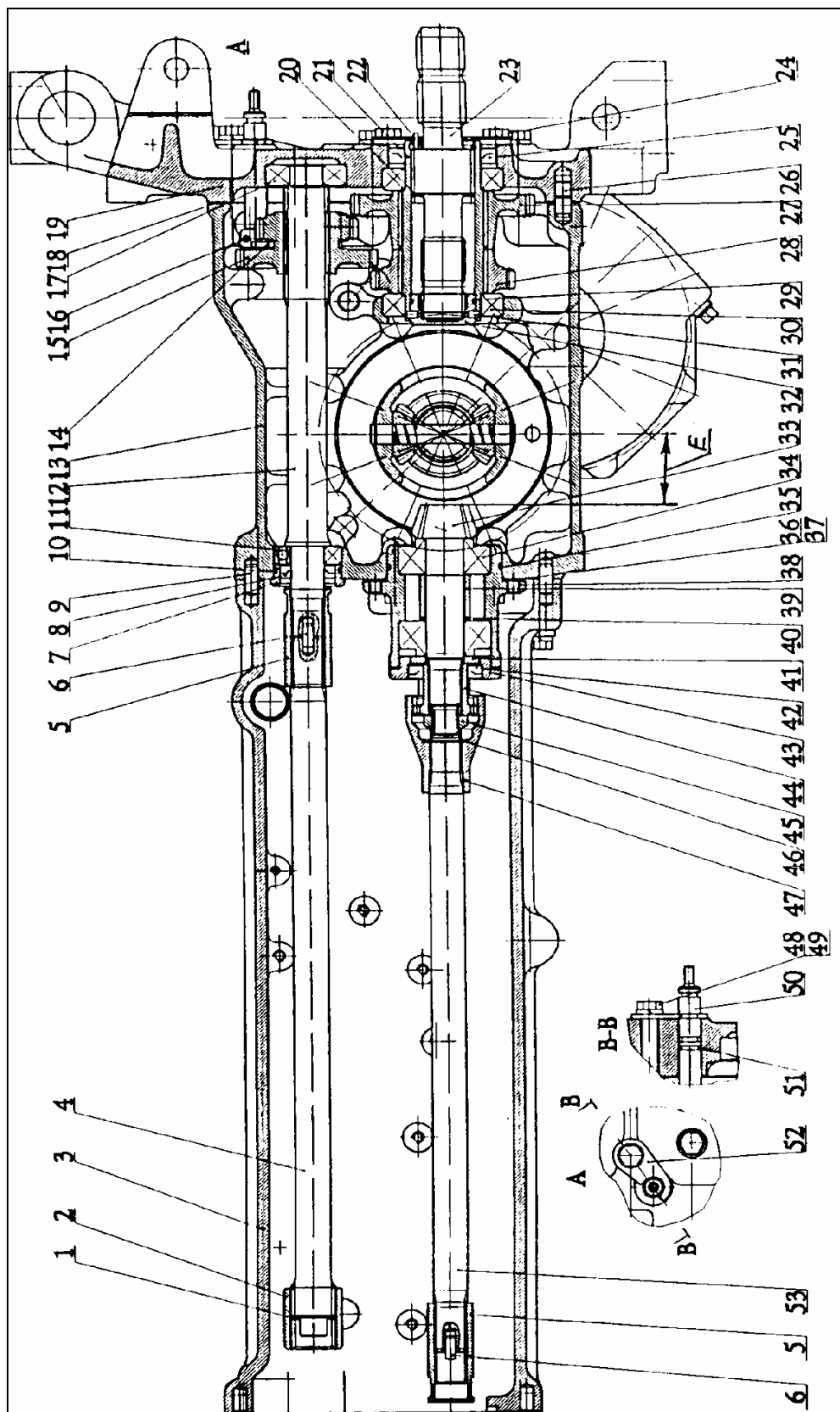


Fig. F-23 Rear axle – longitudinal section
 1- ring; 2- sleeve; 3- body; 4- shaft; 5- sleeve; 6- pin; 7- cover; 8- sealing; 9- retaining pin; 10- o-ring; 11- ball bearing; 12- shaft; 13- rear axle body; 14- fork; 15- compact toothed wheel; 16- pin; 17- ball bearing; 18- sealing; 19- rear cover; 20- retainer ring; 21- sleeve; 22- retainer ring; 23- PTS end; 24- housing; 25- sealing; 26- retaining pin; 27- toothed wheel 540 rpm; 28- toothed wheel 1000 rpm; 29- o-ring; 30- conical bearing; 31- pin; 32- stopper; 33- pinion; 34- conical bearing; 35- o-ring; 36- adjustment washer I; 37- adjustment washer II; 38- pinion housing; 39- distancing sleeve; 40- adjustment washer; 41- oil thrower; 42- sealing; 43- cover; 44- toothed sleeve; 45- nut; 46- retaining ring; 47- tooth clutch; 48- screw; 49- spring washer; 50- shaft; 51- o-ring; 52- retaining plate; 53- drive shaft;

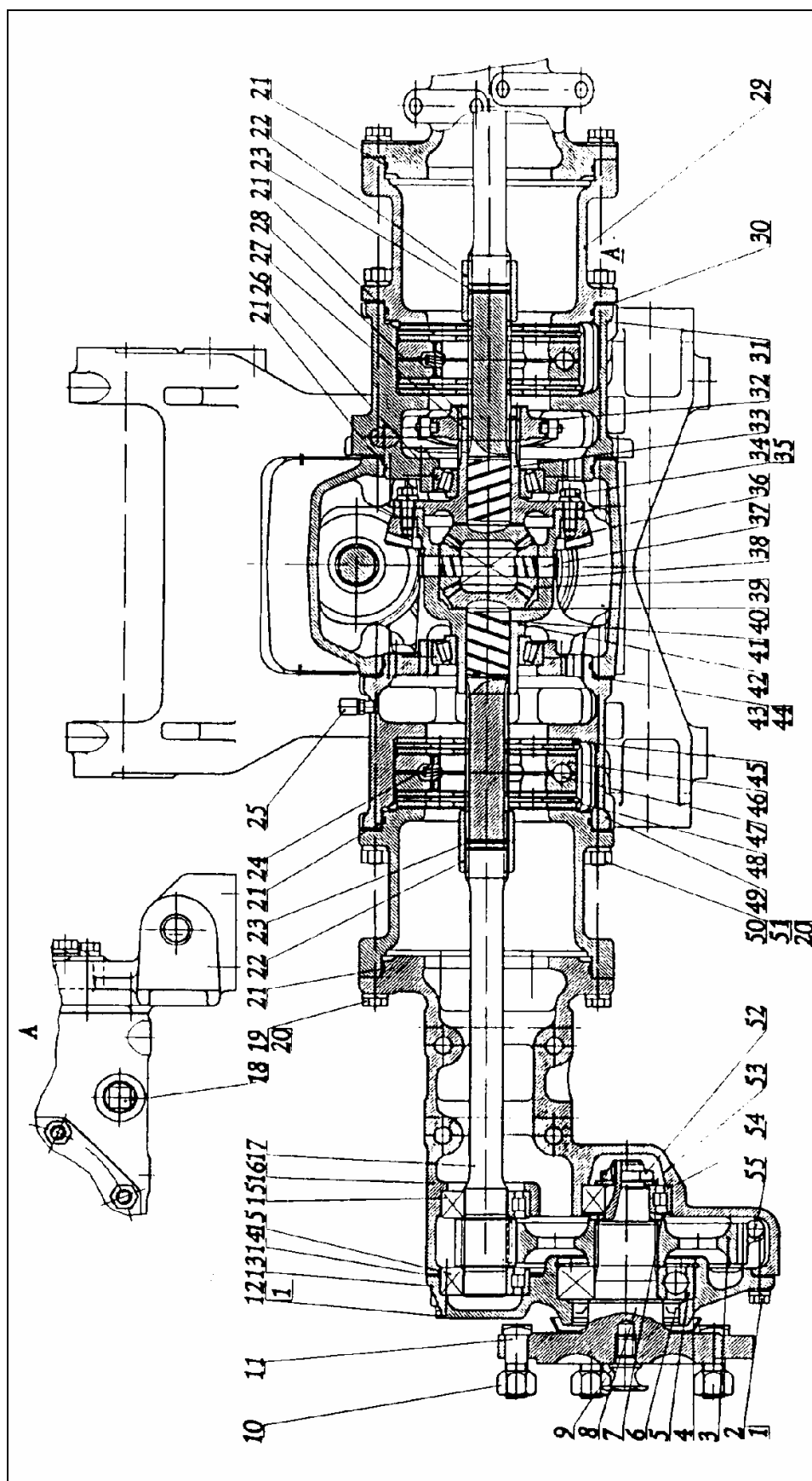


Fig. F-24 Rear axle – cross-section (description)

1- screw; 2- spring washer; 3- driven toothed wheel; 4- retaining ring; 5- ball bearing; 6- sealing; 7- washer; 8- hub; 9- transport grip; 10- nut; 11- hub screw; 12- screw; 13- cover; 14- washer; 15- ball bearing; 16- spur gear drive sheath; 17- spur gear drive shaft; 18- inspection/filling plug; 19- screw; 20- spring washer; 21- o-ring; 22- connecting sleeve; 23- retaining ring; 24- pressure disc spring; 25- body vent; 26- conical bearing; 27- sleeve; 28- retaining ring; 29- attachment; 30- sealing; 31- brake body (left); 32- lock clutch; 33- differential gear cover; 34- screw; 35- spring washer; 36- crown disc; 37- planet gear bolt; 38- retaining ring; 39- planet gears; 40- slide washer; 41- crown wheel; 42- differential gear body; 43- adjustment washer I; 44- adjustment washer II; 45- friction disc; 46- pressure disc; 47- ball; 48- intermediate disc; 49- brake body (right); 50- stud bolt; 51- nut; 52- nut; 53- bearing washer; 54- roller bearing; 55- drain plug.

Differential gear

Structure (Fig. F-25)

The differential gear consists of differential gear body 10, cover 5, crown wheels 6, 9 and two planet gears 8 seated on the axle 7 within the body.

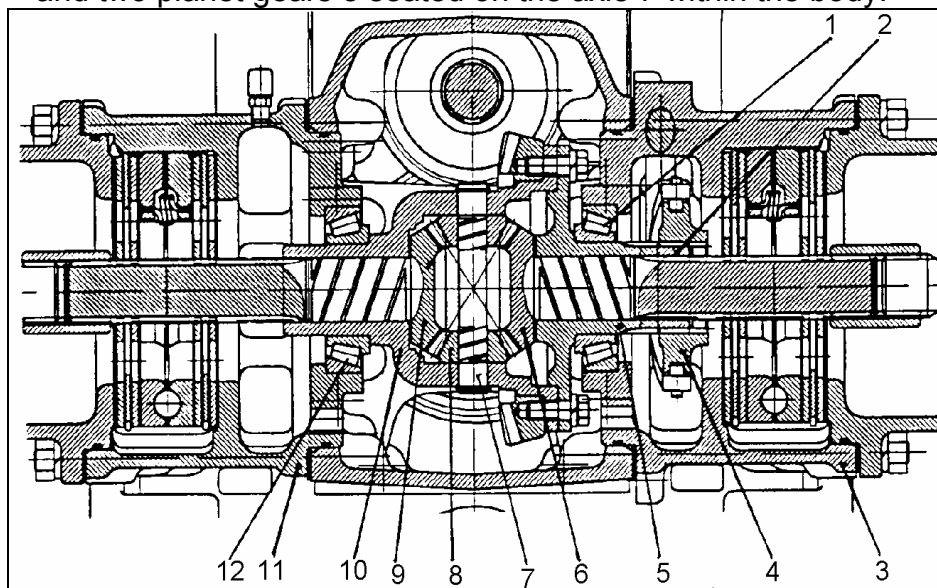


Fig. F-25 Differential gear – cross section.
1- conical bearing; 2- sleeve; 3- brake body (left); 4- clutch; 5- differential gear cover; 6- crown wheel; 7- planet gear axle; 8- planet gears; 9- crown wheel; 10- differential gear body; 11- brake corps (right); 12- conical bearing;

Adjustment

The differential gear bearings 1 + 12 should be installed with initial tension so that minimum torque required for rotating the differential gear amounts to 3...5 Nm. Torque measurement should be performed after executing a few rotations of the differential gear. Adjustment & measurement is performed after removing the pinion from the rear axle as follows:

- place between the right brake body and the rear axle body two sets of adjustment washers 43, 44 consisting of three washers of 0,5 mm and three of 0,2 mm thickness, and screw both bodies with two screws;
- put subsequently adjustment washers 43, 44 between the right brake body and the rear axle body until obtaining proper tension of conical bearings. Number of washers of the same thickness should be equal, but there should be not less than two 0,2 mm washers.

Differential gear lock

The rear axle is fitted with the differential gear lock, which enables to achieve better traction conditions in unfavourable field conditions. The lock is activated with the tooth clutch 4 through connecting left half-shaft 6 with the differential gear cover 5.

Activation of the differential gear lock

Activation consists in shifting the lever 1 (Fig. F-26) up or down, what causes – through the system of levers and arms – dislocation of the tooth clutch 4 (Fig. F-25) activating the differential gear lock. When the handle 1 is in the rear position (Fig. F-26) the lock is off; when in fore position – the differential gear is locked.

Switching on/off the lock should be performed when the clutch is disengaged and at minimum tractor speed.

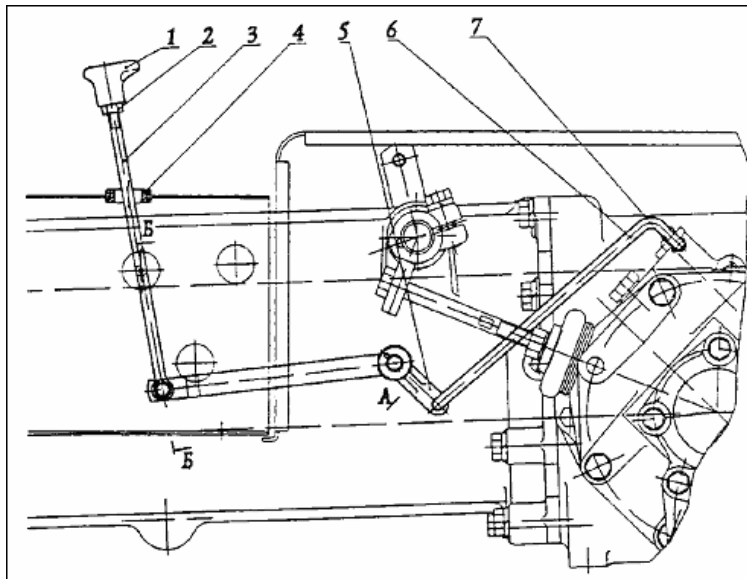


Fig. F-26 Control unit of the differential gear lock (view from left).
1- handle; 2- nut; 3- pull rod; 4- sleeve;
5- lever; 6- pull rod; 7- cotter pin;

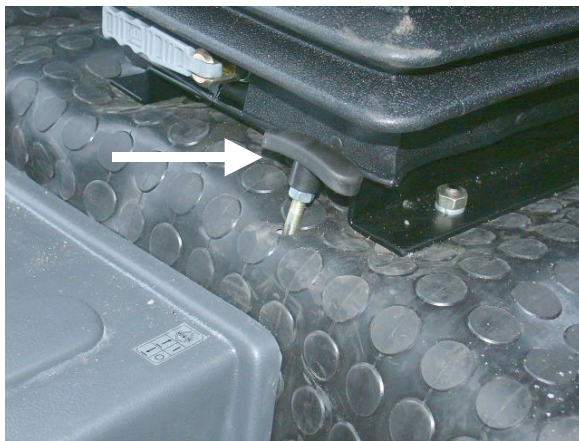


Fig. F-27. Pull rod of the differential gear lock

The differential gear lock should be used always when we want to increase tractor motion effectiveness – always, when appears slip of one wheel in relation to the other one.

The most frequent causes of slip are:

- bad field conditions,
- bad, rainy weather, winter
- worn tyres.

Worn tyres and especially significant difference between wear of individual tyres may cause slip and excessive use of the differential gear lock. It is always necessary to find out and check if the necessity of switching on the lock is not caused by bad tractor's technical condition. Other two above mentioned causes are justified.

Utilisation of the lock – according to its purpose – should be limited to so called low gears. On flat and moderately undulating terrain the operator's safety is sufficient. Increased risk appears when we use the lock:

- while driving in ruts,
- while towing agricultural machines and trailers,
- while working on slope.

The lock should be obligatory switched off while entering a public road or on a road with hard surface.

OPERATIONAL NOTES:

1. ALWAYS COUPLE BRAKE PEDALS BEFORE LOCKING THE DIFFERENTIAL GEAR.
2. DO NOT ACTIVATE THE LOCK WHILE DRIVING UP THE STEEP HILL.
3. BEFORE SWITCHING ON THE LOCK MAKE SURE THAT FRONT WHEEL ARE STRAIGHTENED AND THE TRACTOR DRIVES STRAIGHT AHEAD.



CAUTION:

NEGLIGENCE IN OBSERVATION OF ABOVE MENTIONED RECOMMENDATIONS MAY CAUSE PROBLEMS WITH TRACTOR STEERING AND MAY LEAD TO LOOSING CONTROL OVER THE TRACTOR INCLUDING TRACTOR'S OVERTURN

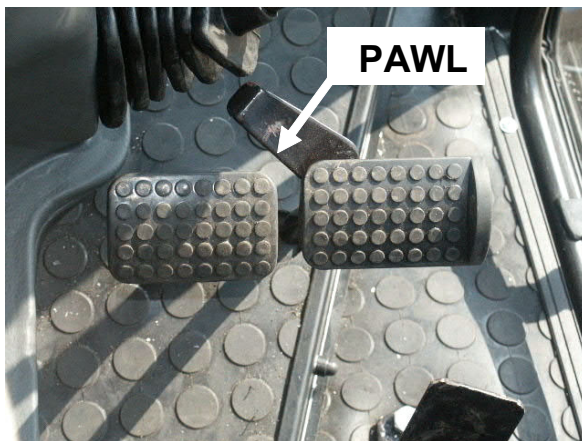


Fig. F-28. Couple brake pedals with a pawl before switching on the lock.

4. DO NOT ADJUST PULL RODS OR OTHER ELEMENTS OF THE DIFFERENTIAL GEAR LOCK – IN THE CASE OF PROBLEMS CALL THE NEXT ASS.

Maintenance of the rear axle.

To replace oil in the rear axle:

1. Unscrew the drain plug 3 (Fig. F-29) on the left side of the rear axle body underneath the tractor and drain used oil to a tub.
2. Caution: access from behind is a bit difficult thus unscrew the plug while the tractor is standing on a ramp or over an inspection pit.
3. Unscrew drain plugs of the spur gear drives 6 (Fig. F-30)
4. Tighten the rear axle drain plug and plugs of the spur gear drives.
5. Unscrew the plug (4) (Fig. F-29) and fill with suitable oil (11 dm³).

When poured to the rear axle body oil goes to spur gear drives. Having filled the body up to the edge of the inspection / filling plug wait a few minutes and again replenish the oil up to the edge of the inspection / filling plug.

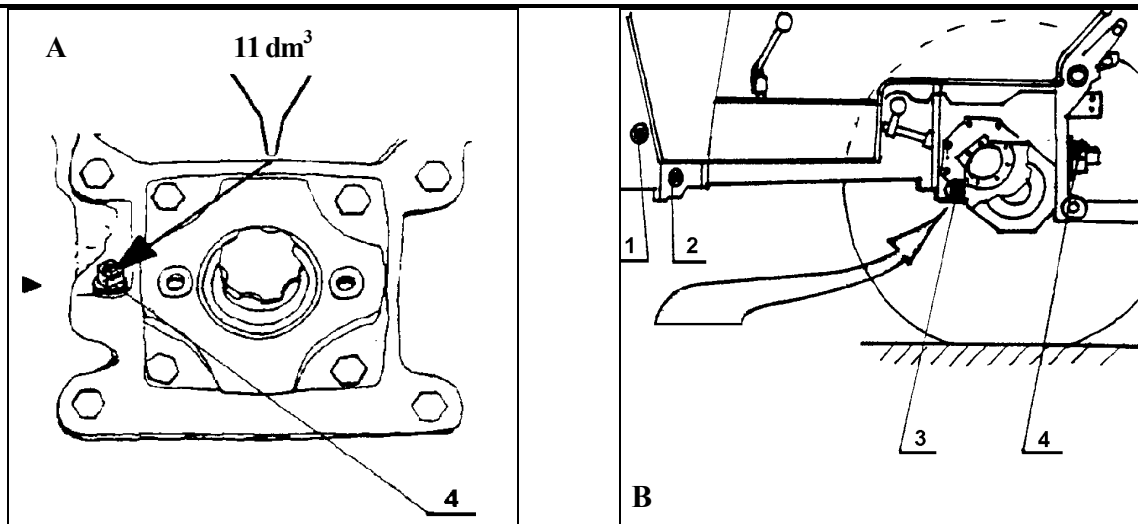
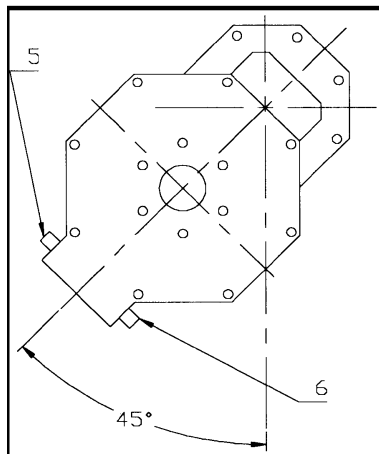


Fig. F-29. Inspection / filling plug and drain plug of the rear axle.

A: rear view , B: left view

1- gearbox filling plug; 2- gearbox drain plug; 3- rear axle drain plug; 4- rear axle inspection / filling plug.



The rear axle unit is fitted with rear spur gear connected through sheaths in such way that their main vertical symmetry axes form the angle of 45° - what results in impression that both spur gear drives are inclined toward the rear of the tractor.

Fig. F-30. Plugs of rear spur gear drives
5- stopper; 6- drain plug.

10. REAR POWER TRANSMISSION SHAFT (Fig. F-31)

Structure

The rear PTS seated in the rear axle body enables coupling of agricultural machines, which require dependent or independent drive with two various operational speeds. The PTS rotational speed (rpm) at rated engine rpm and with independent drive amounts to 540 or 1000 rpm. When the dependent drive is on, the PTS shaft speed amounts to 3,4 or 6,3 revolution/1 m (of distance) respectively.

The rear PTS consists of the drive shaft 1 and the reduction gear, which includes:

- shaft 4,
- shiftable double toothed wheel 6,
- toothed wheels 17,18, fixed to the quill 12; the quill is supported with bearings 11,20
- stoppers 22;
- two-sided end PTS 14 with splines for 540 and 1000 rpm (6 and 21 splines) seated on the shaft splines 12 and secured against slipping out with the ring 13.

The toothed wheel 6 can be set in three positions with fork 5 and shaft 10 and secured against slipping out with the plate 23 and screw 9.

Depending on position of the toothed wheel 6, the rear PTS can be set in one of three positions:

I- 540 rpm or 3,4 revolution/1 m

II- 1000 rpm or 6,3 revolution/1 m

III- PTS off.

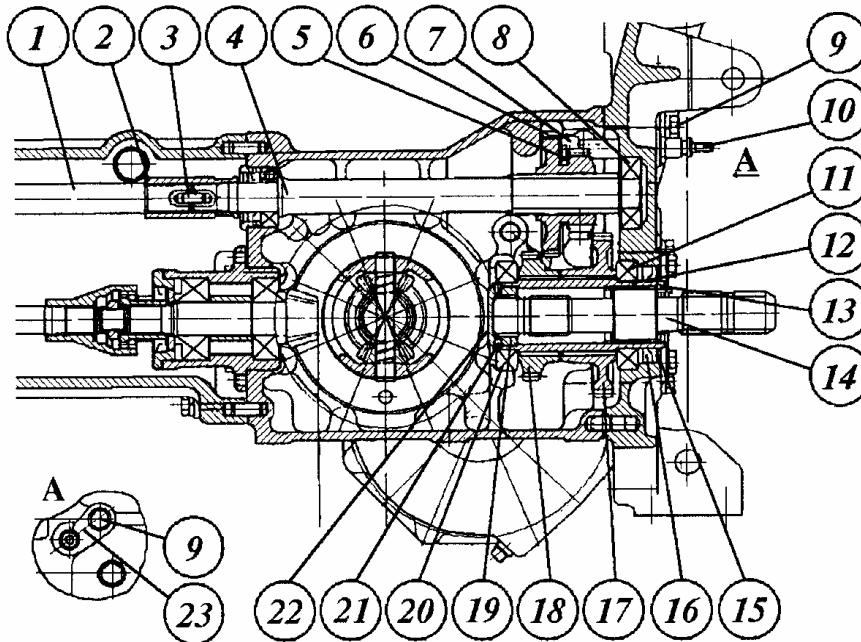


Fig. F-31 Rear power transmission shaft
1,4- shaft; 2- sleeve; 3- pin; 5- fork; 6- toothed wheel; 7- pin; 8,20- ball bearings; 9- retaining pin; 10- shifttable shaft; 11- ball bearing; 12- shaft; 13- securing ring; 14- PTS end; 15- housing; 16- sealing; 17- toothed wheel 540 rpm; 18- toothed wheel 1000 rpm; 19- o-ring; 21- pin; 22- stopper; 23- retaining plate

Coupling of the articulated / telescopic shaft to the tractor and to the agricultural machine should be performed exactly according to recommendations included to the shaft manual.



WARNING

PRIOR TO OPERATE THE TRACTOR COUPLED WITH MACHINES DRIVEN BY THE PTS READ GIVEN BELOW SAFETY PRINCIPLES AND OBSERVE THEM STRICTLY:

1. PRIOR TO COUPLING, ADJUSTMENT OR OPERATION WITH PTS-DRIVEN MACHINES SET THE PTS CONTROL LEVER TO "PTS OFF" AND STOP THE ENGINE.
2. IT IS PROHIBITED TO OPERATE MACHINES WITH HALF-SHIELDED SHAFTS IF THE TRACTOR IS NOT FITTED WITH AN UMBRELLA SHIELD (Fig. F-34 POS. 1)
3. HAVING COUPLED THE ARTICULATED / TELESCOPIC SHAFT WITH THE TRACTOR FASTEN THE CHAIN TO THE UMBRELLA SHIELD DURING OPERATION.
4. HAVING FINISHED OPERATION WITH PTS PUT THE PROTECTIVE CAP ON THE PTS END (Fig. F-34 POS. 2)

The standard version of the tractor is fitted with the umbrella shield at the PTS end. If the tractor will be coupled with machines fitted with fully shielded telescopic shaft, first install the PTS shaft bracket (supplied for special order).

The PTS end rotates right (when looking from tractor's rear).

DEFINITIONS:

1. INDEPENDENT PTS DRIVE- means that the PTS end rotation speed is proportional to the engine speed regardless of driving speed. Independent PTS means that the OPTS end speed is independent from selected gear.
2. DEPENDENT PTS DRIVE – the PTS end rotation speed is proportional to the speed of wheels (= driving speed). Number of end revolutions is proportional to covered distance.

PTS ACTIVATION:

1. TRACTOR WITHOUT PTS CLUTCH

- INDEPENDENT – activate PTS at minimum engine rpm or even when the engine is stopped and the clutch disengaged.
- DEPENDENT – activate PTS during initial motion phase just after gear selection and engaging smoothly the clutch.

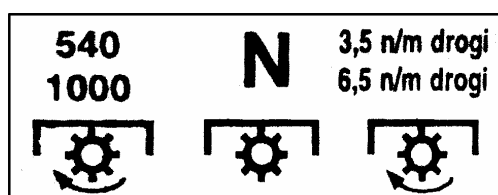
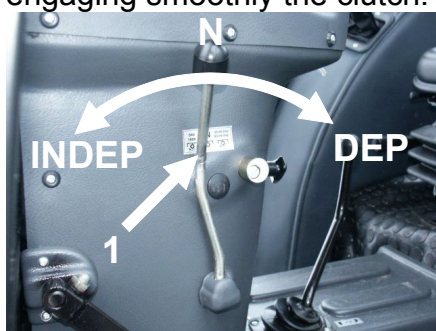


Fig. F-32a Rear PTS control lever (DEPENDENT - INDEPENDENT) (on the left side of the steering column) + pictogram.

Sequence of switching over the PTS to the mode „PTS INDEPENDENT”

1. Set the lever 1 (Fig. F-32a) to N (neutral).
2. Set required PTS end rotation speed (1000 or 540 rpm) Fig. F-36.
3. Start the engine, disengage the clutch (press the pedal) and at minimum engine speed move the lever 1 to forward position; switch the clutch smoothly.

CAUTION:

TO DISENGAGE THE PTS – HAVING DISENGAGED THE CLUTCH (PRESSING THE CLUTCH PEDAL) MOVE THE LEVER 1 TO NEUTRAL POSITION (REARWARD) .

Sequence of switching over the PTS to the mode „PTS DEPENDENT” :

1. Set the lever 1 (Fig. F-32a) of the PTS drive selection N (neutral).
2. Set required PTS end rotation speed PTS - 3,5 rev./1 m or 6,5 rev./1 m (Fig. F-36).
3. Start the engine and with disengaged clutch select the proper gear.
4. Move the lever „toward himself”
5. Switch on the clutch smoothly and slowly so that the tractor coupled with a machine start its motion “softly”.

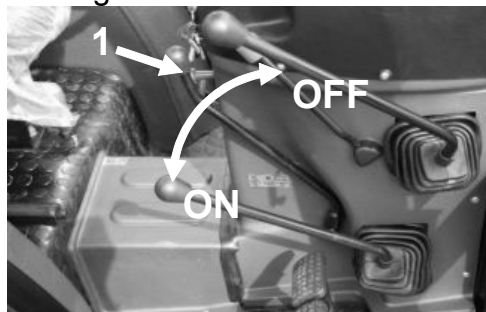
CAUTION:

TO STOP THE PTS AND THE TRACTOR FIRST DISENGAGE THE CLUTCH AND THEN MOVE THE PTS DRIVE SELECTION LEVER 1 TO NEUTRAL POSITION.

PTS ACTIVATION:

2. TRACTOR WITH PTS CLUTCH

- INDEPENDENT & DEPENDENT – use the lever 1 (Fig. F-32a) while the tractor is moving.



CAUTION:

TO DISENGAGE THE PTS MOVE THE LEVER 1 (Fig. F-32b) TO THE UPPER POSITION „PTS OFF”.

Fig. F-32b Rear PTS control lever (on the right side of the steering column) + pictogram

Sequence of switching over the PTS to the mode „PTS INDEPENDENT”

1. Set the lever 1 (rys F-32b) to „PTS on”;
2. Move the pull rod 2 (rys F-33) from the bean-shaped opening B to the round opening A. The pull rod is situated on the left side of the control console under the cover 3
3. Set required PTS end rotation speed (1000 or 540 rpm) Fig. F-36.
4. Start the engine and while stopped or during move the lever 1 (rys F-32b) to the lower position „PTS on”.

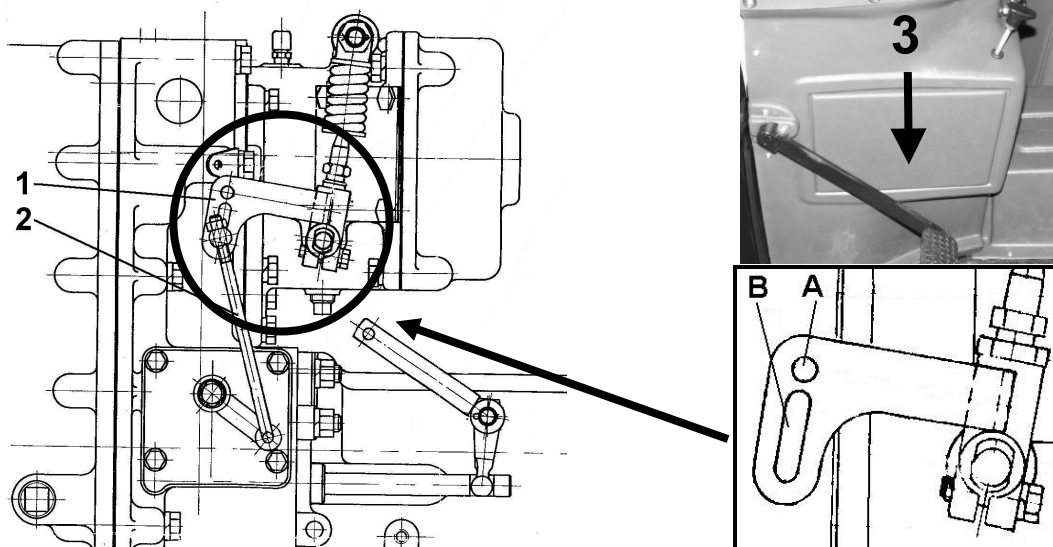


Fig. F-33. Switching over PTS DEPENDENT – PTS INDEPENDENT for tractors with the PTS clutch. 1- lever; 2- pull rod; 3- cover; A- round opening; B- bean-shaped opening

Sequence of switching over the PTS to the mode „PTS DEPENDENT”

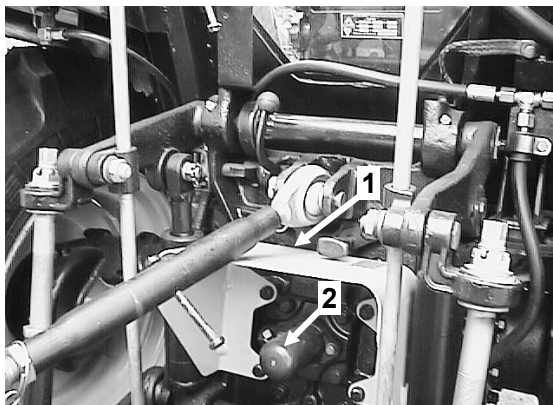
1. Set the lever 1 (rys F-32b) to „PTS off”;
2. Move the pull rod 2 (rys F-33) from the bean-shaped opening B to the round opening A. The pull rod is situated on the left side of the control console under the cover 3.
3. Set required PTS end rotation speed (1000 or 540 rpm) Fig. F-36.
4. Start the engine and while stopped or during move the lever 1 (rys F-32b) to the lower position „PTS on”.



WARNING

PRIOR TO MOVING THE TRACTOR WITH REAR GEAR ON (DEPENDENT PTS DRIVE ON) MOVE THE PTS CONTROL LEVER TO „PTS OFF”. OTHERWISE THE DRIVING GEAR OF COUPLED MACHINE WILL CHANGE THE ROTATION DIRECTION WHAT MAY LEAD TO ITS DAMAGE

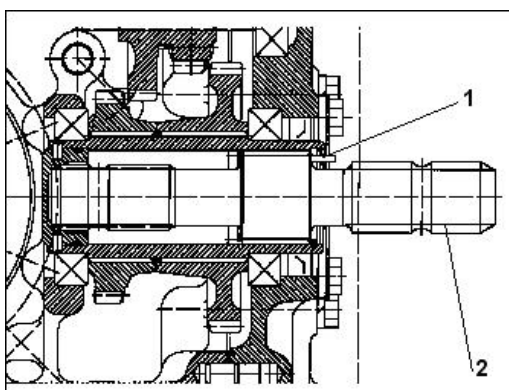
Change of PTS end rotation speed 540 - 1000 rpm:



PTS enables co-operation with machines, which require 540 or 1000 rpm. To change rotation speed:

- change (turn) the PTS end
- change position of the limiter lever 540 - 1000 rpm

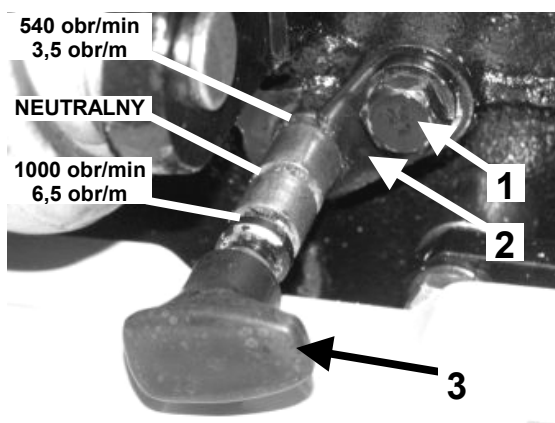
Fig. F-34 Umbrella shield of the PTS end (1) and protective cap (2)



The sequence of PTS end change is as follows:

1. Remove the securing ring 1 (Fig. F-35).
2. Pull out the PTS end 2 and flip it.
3. Put the PTS end to the housing and install the securing ring 1.

Fig. F-35. Two-sided PT end
1- securing ring; 2- PTS end.



Unscrew the bolt 1, unlock the shaft 3 by removing the retaining plate 2 from the groove. Pull in or pull out the shaft 3 into/from the rear axle body, secure the shaft against shift by putting the retaining plate into the suitable groove and tighten the screw 1.

Fig. F-36 Selection of PTS end rotation speed 540 - 1000 rpm
1-retaining screw; 2-retaining plate; 3-shaft fitted with retaining grooves.

11. FRONT DRIVE AXLE

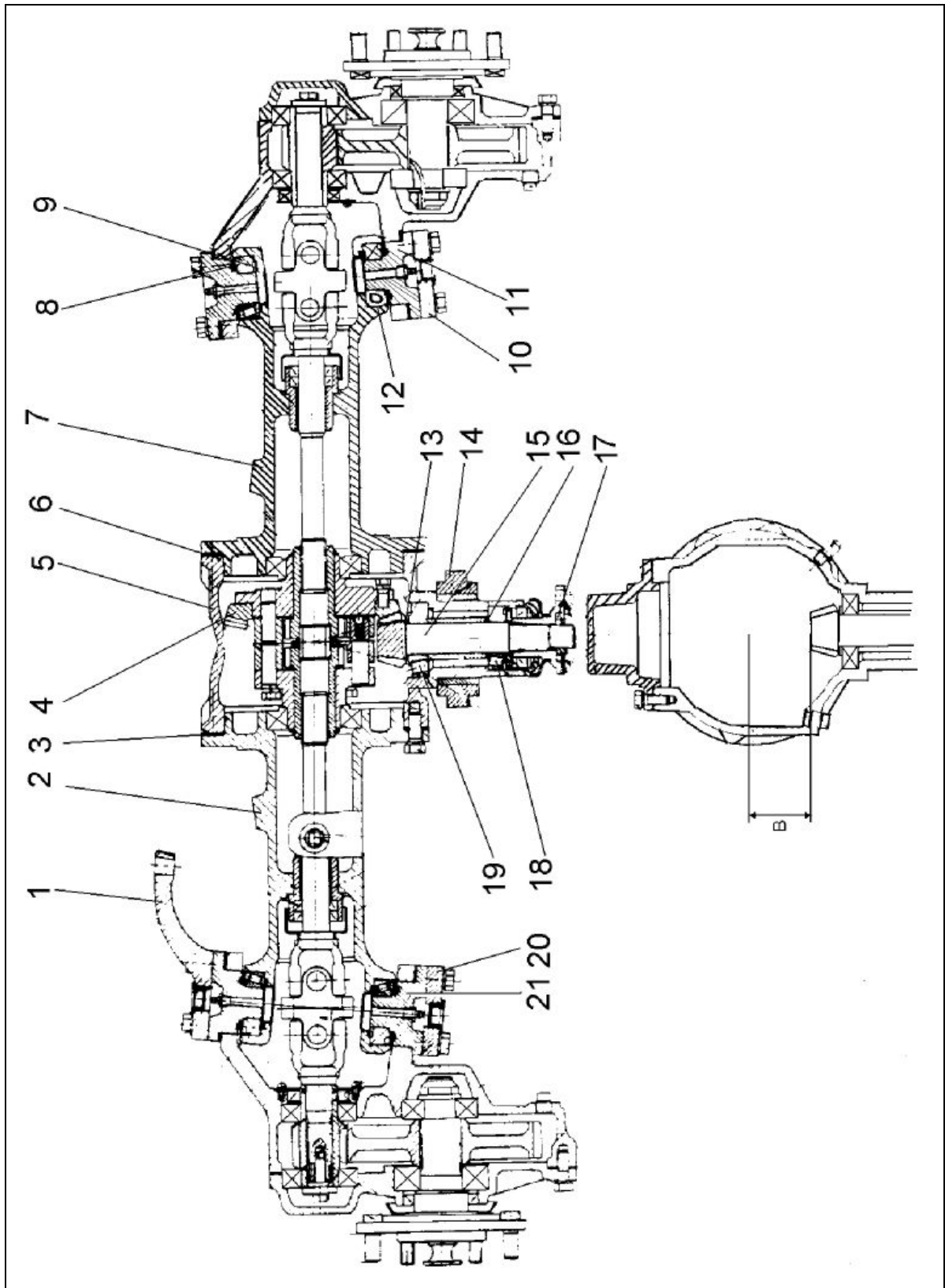


Fig. F-37 Front drive axle

1- knuckle arm; 2- left body; 3, 6 spacers; 4-crown wheel; 5- differential gear housing; 7- left body; 8- spacers; 9,12 – conical bearings; 10,21- knuckle bolt; 11- lower lever (right); 13, 16- spacers; 14- pinion housing; 15- pinion; 17- nut; 18, 19 – conical bearing; 20- lower lever (left).

The front drive axle is driven by the output shaft of the gearbox. It consists of main transmission gear, differential gear, homokinetic articulated joints and spur gear drives.

The front drive axle is designed in such way that its drive switches on when the slip of rear wheels exceeds 4%. The axle is an automated construction without pull rods and requires neither adjustment nor maintenance. For this reason in the case of any problems call the next ASS.

Main transmission gear

Consists of the crown wheel 4 and the pinion 15 (Fig. F-37). The pinion 15 is supported in the housing 5 with two conical bearings 18 and 19, and the crown wheel is fastened with screws to the differential gear body.

The conical bearings of the pinion 15 are provided with initial tension 0,01...0,04mm which may be adjusted through selection of spacers 16. The torque required for turning the pinion 15 together with bearings should be within the range 0,2...0,4 Nm. Nut tightening moment 17 - 120...150 Nm.

While assembling the pinion 15 together with bearings pay attention to the dimension „B“, which should amount to $59,5^{+0,19}$ mm, and which can be adjusted with washers 13, 16.

Side play between teeth in the main transmission gear should amount to 0,08...0,3 mm, and the tooth mesh surface should be not less than 50%. Point of teeth contact should be situated in the central part of a tooth or closer to the upper part of the cone. Play adjustment is realised by moving part of washers 6 (Fig. F-37) from under the body flange 7 under the body flange 2 without changing total number of washers.

Caution: Side play adjustment in the main transmission unit should be performed only after adjustment of play in conical bearings of the differential gear.

Differential gear (Fig. F-38)

Enables rotation of front drive wheels with various speeds while performing U-turns and also transmits torque to front wheels if the slip of rear wheels is greater than 4%.

Structure

The differential gear is supported with two conical bearings 9 in bodies of the front axle. The gear consists of two bodies 1 and 7, clutches 8, axles 5 together with firmly fastened pawls 12, an disc 6.

Operation principle

When the crown wheel 2 rotates, pawls 12 mesh with clutches 8 as the result of friction power arising in the contact point of the disc 6 and axle protrusions 5. The friction force is caused by springs 4 pressing the axle 5 toward the disc 6. Depending on rotation direction of the crown wheel 2 the pawl 12 meshes with the clutch 8 with one of splines A or B. If rear wheels rotate with slip lesser than 4% then the clutches 8 rotate inside of the crown wheel 2, and pawls 12 jump over four clutch splines 8. If rear wheels reach the slip of 4%, rotation speeds of clutches 8 and crown wheel 2 become equal. If the slip value grows higher the torque is transmitted from the crown wheel 2 through pawls 12 to clutches 8 and further through homokinetic articulated joints spur gear drives and drive wheels.

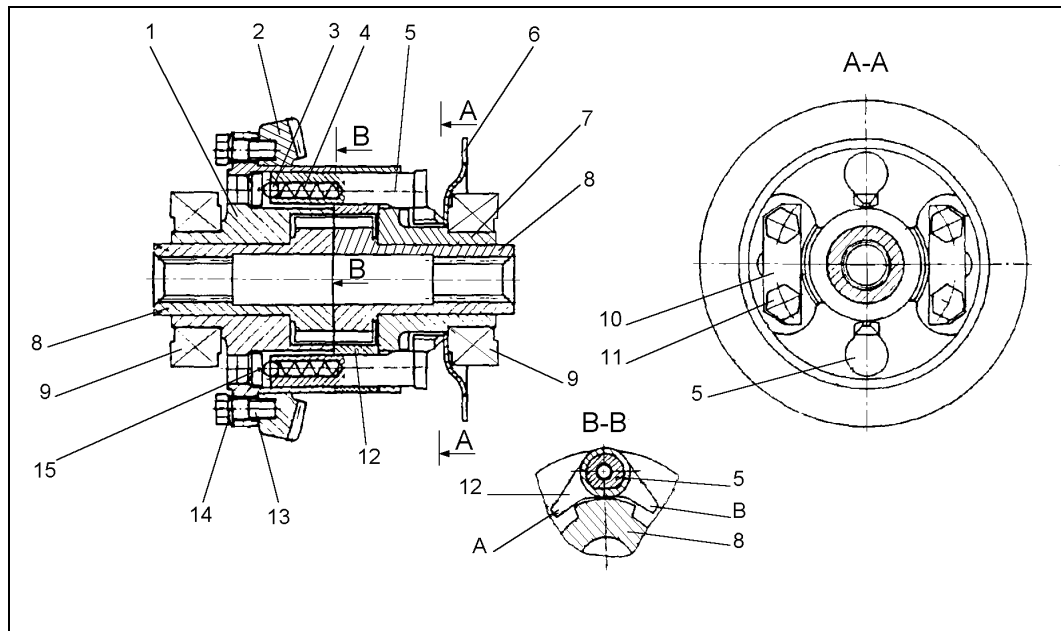


Fig. F-38 Front axle differential gear

1- right body; 2- crown wheel; 3- ball; 4- spring; 5- axle; 6- disc; 7- left body; 8- clutch; 9- conical bearings; 10- bendable washer; 11- screw; 12- pawls; 13- screw; 14- washer; 15- stopper

Adjustment

The bearings of the differential gear 9 should be provided with initial tension so that the minimum force at the crown of the crown wheel of the differential gear amounts to 55...75 N. Prior to torque measurement perform a few revolutions with the differential gear. Adjustment & measurement can be executed after removing the pinion from the differential gear housing 5 of the front axle as follows (Fig. F-37):

- place between the right body 7 and the differential gear housing two sets of adjustment washers 6 and screw both bodies with two screws;
- put subsequently adjustment washers 3 between the left body 2 and the differential gear housing until obtaining proper tension of conical bearings. Number of washers of the same thickness should be equal, but there should be not less than two 0,2 mm washers.

Spur gear drives (Fig. F-39)

Spur gear drives are supported in bodies 2 i 7 (Fig. F-37) with two conical bearings 9 and 12. Each spur gear drive consists of body 7 (Fig. F-39), cover 1, a pair of toothed wheels 3, 17, hub 18, and homokinetic articulated joint 11.

The initial tension of conical bearings 9 and 12 (Fig. F-37) can be adjusted with adjustment washers 8 so that the force required for turning the spur gear drive (applied to the hub) amounts to 30...50 N.

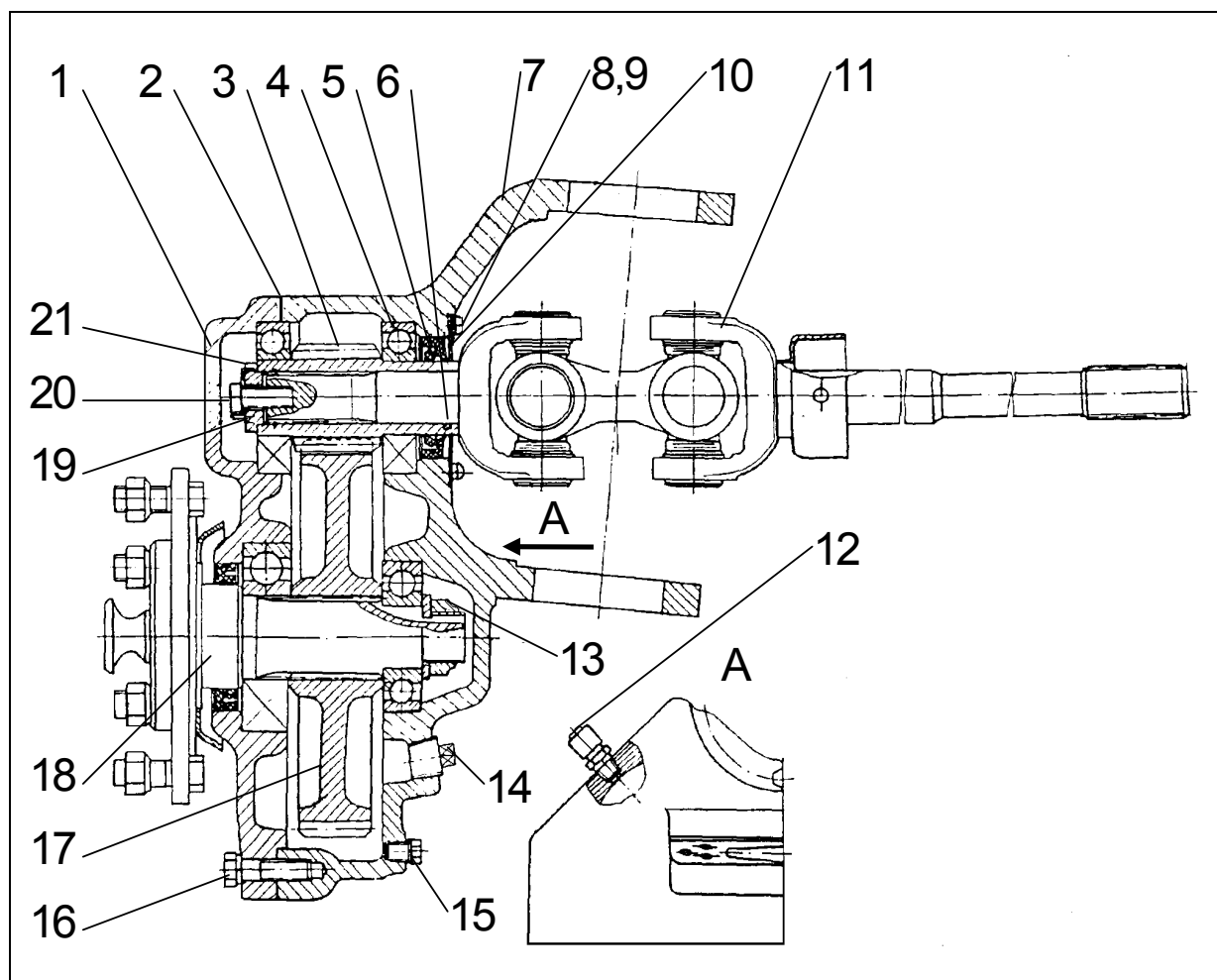


Fig. F-39 Front axle spur gear drive.

1- cover; 2- sealing; 3,17- toothed wheels; 4- ball bearing; 5- sealing; 6- o-ring; 7- spur gear drive body; 8- screw; 9- spring washer; 10- anti-dust shield; 11- homokinetic articulated joint; 12- vent; 13- nut; 14- inspection / filling plug; 15- drain plug; 16- screw; 18- hub; 19- washer; 20- screw; 21- bendable washer.

Front axle drive shaft (Fig. F-40)

The drive shaft transmits the torque from the gearbox output shaft to the front axle.

Maintenance of the drive shaft consists in periodical (every 125 mth) inspection of play in articulated joints and tightening of screws of the shaft flange with the torque of 45...50 Nm.

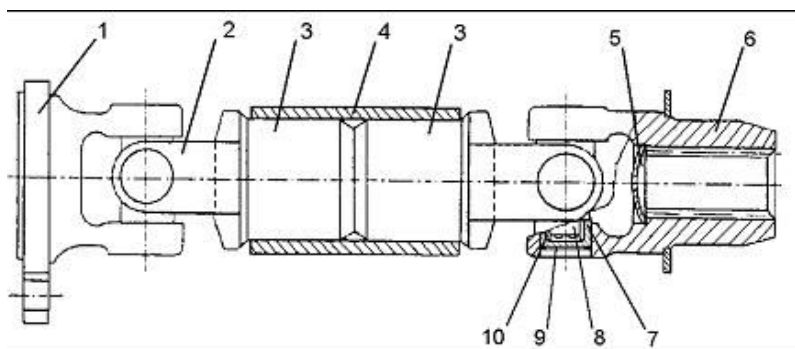
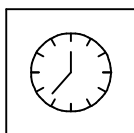
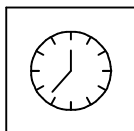


Fig. F-40 Front axle drive shaft – longitudinal section
1- flange; 2- articulated joint; 3- fork; 4- tube; 5- stopper; 6- fork; 7- bearing housing; 8- star piece; 9- retaining ring; 10- needle bearing



Check and replenish (if necessary) the oil level in the front axle and its spur gear drives every 125 mth or if leakage appears.



Replace oil in the front axle every 1000 mth. Each oil replacement requires draining of old used oil and filling the gear housing (1,8 l) and each spur gear drive (0,4...0,5 l) with new oil.

Only when the tractor operates in very muddy and wet conditions replace oil in spur gear drives every 500 mth.

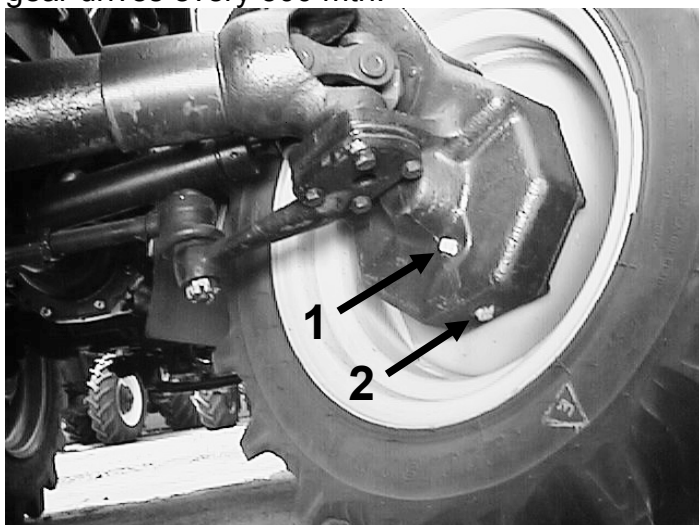


Fig. F-41. Spur gear drives of front wheels 1- inspection / filling plug; 2- drain plug.

Oil replacement in spur gear drives of the front axle:

- place a tank under the relevant drain plug,
- unscrew relevant drain plug (for the main transmission gear – invisible from forward, situated on the side of the drive shaft) and filling plugs,
- having the oil drained screw in the drain plug,
- fill with pure oil up to recommended level (to the edge of the filling plug), screw in filling plugs.

12. TRACTOR'S HYDRAULIC SYSTEM

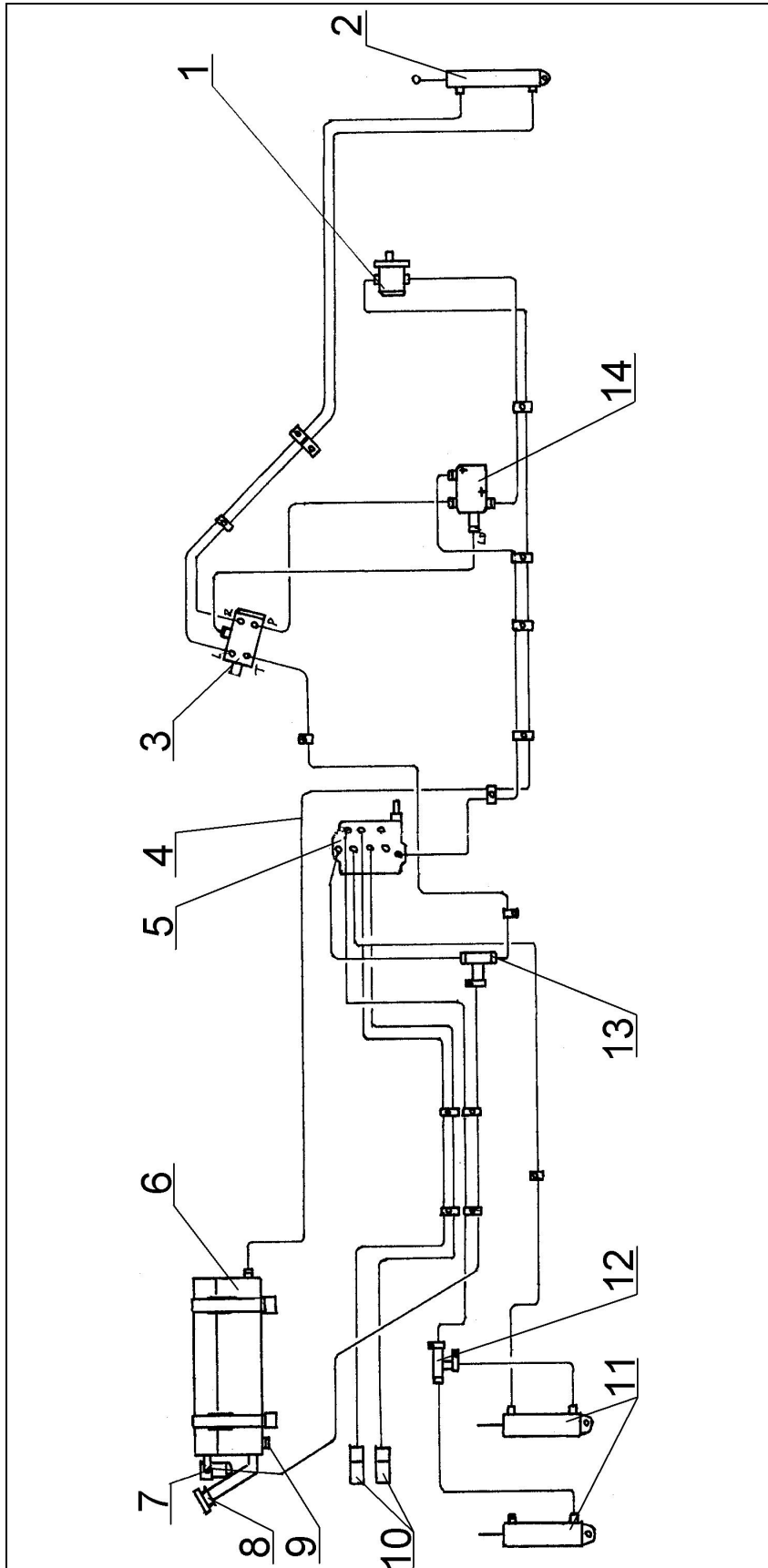
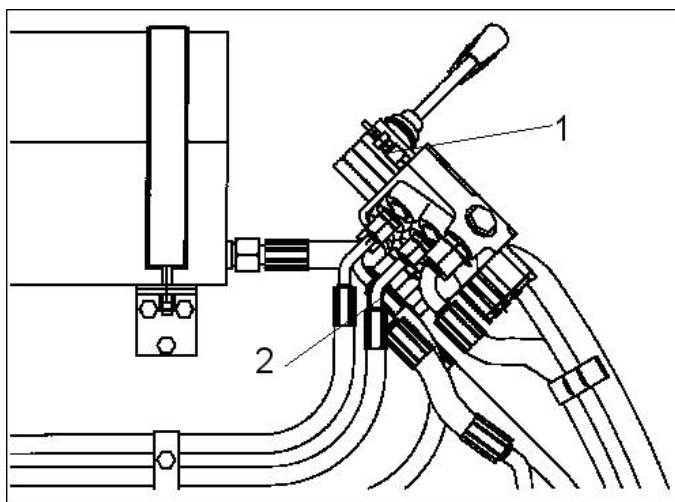


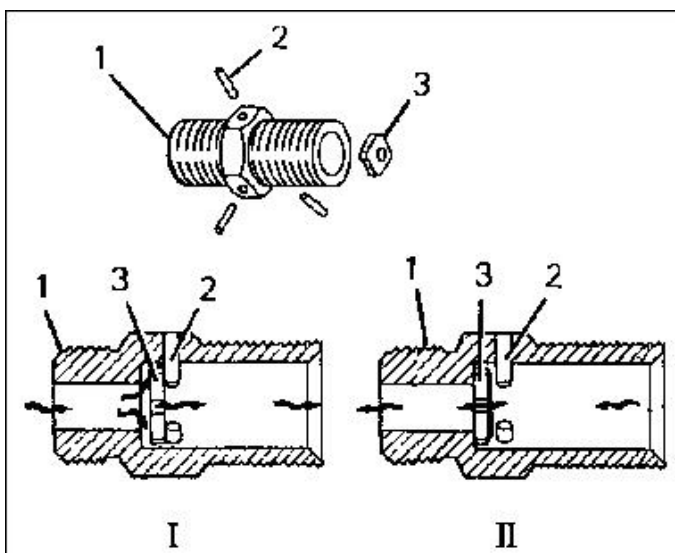
Fig. F-42 Hydraulic unit diagram of the PRONAR-320A tractor.

1- steering & hydraulic system pump; 2- steering system cylinder; 3- control block „Orbitrol”; 4- hydraulic conduits; 5- hydraulic system distributor; 6- oil tank; 7- oil filter; 8- oil filling plug; 9- oil tank drain plug; 10- hydraulic quick-release connectors; 11- hoist cylinder; 12, 13- T-pipe; 14- priority valve.



Safety valve limits the maximum pressure in the hydraulic system. The valve is set to 18 MPa.

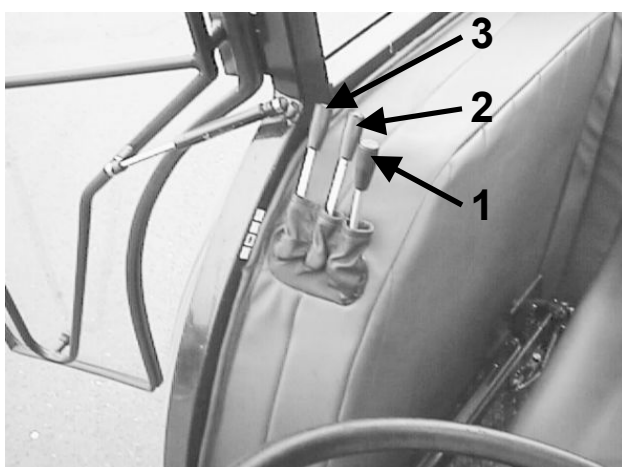
Fig. F-43 Hydraulic system distributor. 1- safety valve; 2- location of the throttle valve.



Throttle valve is designed for reduction of falling down speed of lower pull rods when coupled agricultural machines are heavy. The valve is screwed into the distributor output opening, which is connected via a conduit to raising chambers of cylinder.

Fig. F-44 Throttle valve - unidirectional. 1- valve body; 2- mandrel; 3- plate; I- oil flow during raising; II- oil flow during lowering

HYDRAULIC DISTRIBUTOR



Control levers of the hydraulic system are situated on the right side of operator's seat (on the right wing), see drawing F-45.

Fig. F-45 Location of the hydraulic system control levers. 1- free or quick-release connector; 2- quick-release connector or front RH; 3- rear RH

All three levers – depending on its position (1-4) – perform relevant functions (Fig.F-46):

G - RAISING (pull up to the first pawl).....- levers 1,2,3
 N - NEUTRAL (hoist off).....- levers 1,2,3
 OP - LOWERING (press down to the first pawl).....- levers 1,2,3
 PL - FLOATING (press down to the second pawl).....- levers 1,2,3

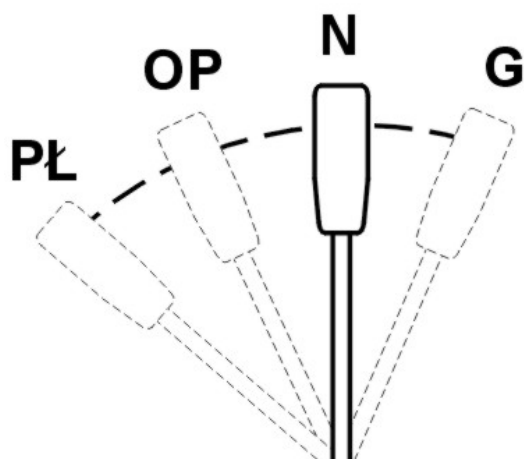


Fig. F-46 Location of the hydraulic distributor lever.



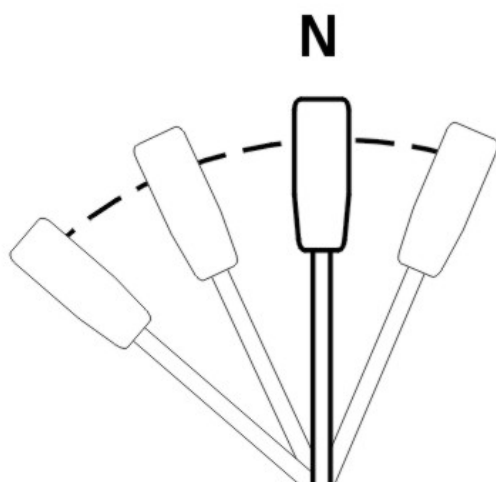
WARNING:

TO SELECT REQUIRED OPERATIONAL SETTING MOVE THE DISTRIBUTOR LEVER FROM „N” TO THE CHOSEN POSITION ONLY AFTER **STARTING THE TRACTOR ENGINE FIRST**.

CAUTION

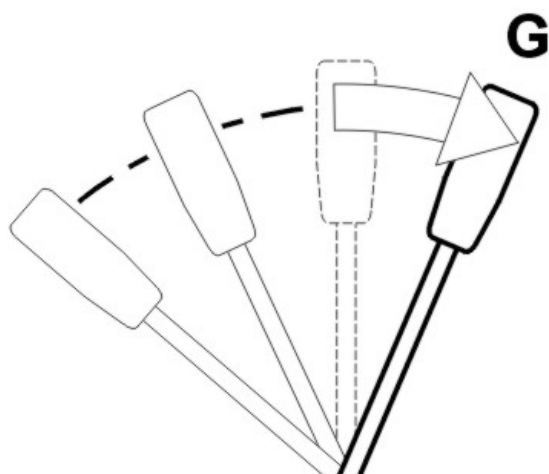
- ABOVE MENTIONED REMARKS CONCERNS ALL THREE LEVERS
- QUICK, SMOOTH MOVE DOWN (CAUSED BY GRAVITY) – ESPECIALLY WHEN COUPLED MACHINES ARE HEAVY – OCCURRING WHEN THE ENGINE AND THE PUMP ARE OFF AND THE TANK IS FULL MAY CAUSE FAILURE OR DAMAGE

FUNCTIONS OF THE FOUR-POSITION THREE-SECTION DISTRIBUTOR:



NEUTRAL (Fig. F-47) - if the lever is in the „neutral” position (second position counting from above) no unit performs any move and any work. Hoist hydraulic cylinders stay asleep (and any other external equipment) Hydraulic oil returns from the pump via distributor to the tank.

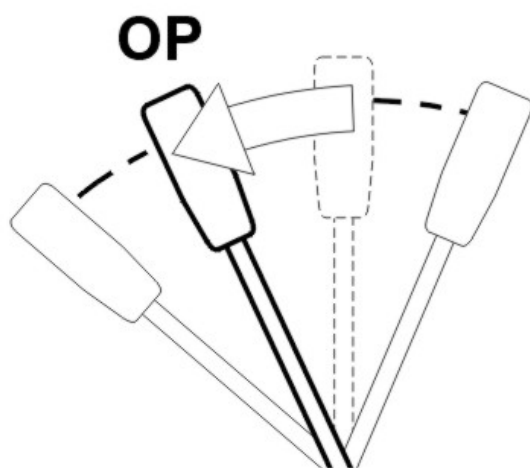
Fig. F-47 Neutral position -N.



RAISING (Fig. F-48) – function of raising is realised through pulling up the lever upwards – from the neutral to the G position. Three-point tool fastening unit raises because oil is pumped via distributor to the lower part of the cylinder (under the piston) and raises hoist arm upwards.

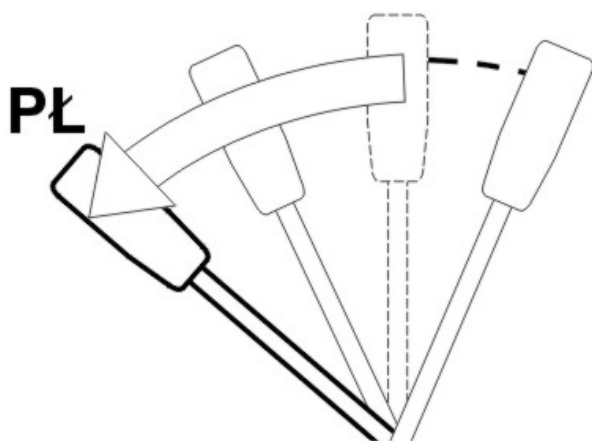
Cylinder conduits of the external hydraulic system should be connected in such way that the distributor control pattern is preserved.

Fig. F-48. Hydraulic hoist. Function - RAISING position G- raising.



LOWERING (Fig. F-49) – press the lever down from the neutral to the OP position just below the neutral position. The hydraulic system distributor becomes switched over in such way that the oil is pumped via pump above the piston, pushes the piston rod toward the cylinder inside and the hoist arms become lowered.

Fig. . F-49 Hydraulic hoist. Function - LOWERING position OP-lowering.



FLOATING (Fig. F-50) - by pressing down the hoist control lever from the neutral to the PL position (two steps down) we obtain the lever position for the FLOATING function. The hydraulic system distributor becomes switched over in such way that the oil flows freely between cylinder chambers. The hydraulic oil returns from the pump via distributor to the oil tank. Above mentioned principle concerns also the external hydraulic system. The floating function ensures preservation of variable position of hoist arms depending on position of the machine's gauge wheel.

Fig. F-50 Hydraulic hoist. Function - FLOATING ; position PL- floating.

EXTERNAL HYDRAULIC SYSTEM

The tractor PRONAR-320AM is fitted with two hydraulic connectors (quick-release), situated in the rear part of the tractor.



WARNING:

PRIOR TO CONNECTING ADDITIONAL EQUIPMENT, WHICH REQUIRES SUPPLY FROM THE TRACTOR'S HYDRAULIC SYSTEM CHECK DEFINITELY COMPATIBILITY OF QUICK-RELEASE CONNECTORS IN BOTH COUPLED MACHINE AND TRACTOR. INCOMPATIBILITY MAY CAUSE DAMAGE, FAILURES AND EVEN AN ACCIDENT

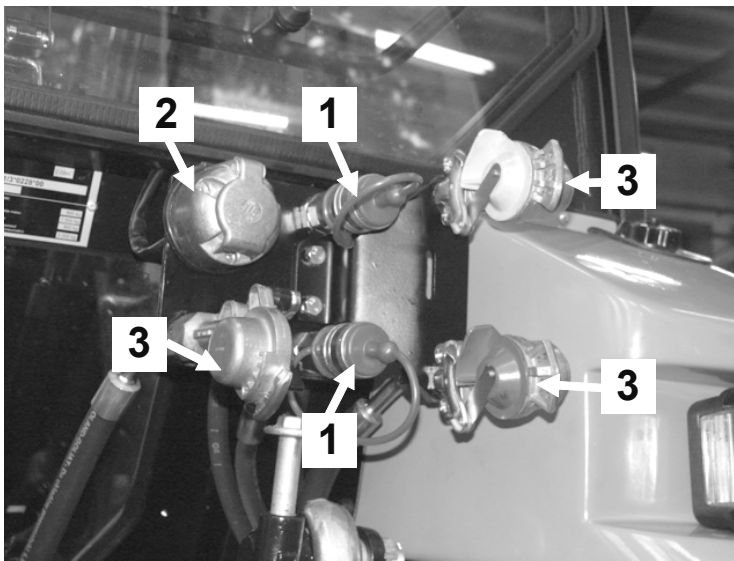


Fig. F-51. External hydraulic connectors. 1- hydraulic connectors; 2- electric connector; 3- pneumatic connector

HYDRAULIC SYSTEM MAINTENANCE

WE CAN ENSURE EFFECTIVENESS OF THE HYDRAULIC SYSTEM OBSERVING FOLLOWING PRINCIPLES:

- Prior to connecting the external cylinder conduit make sure that oils are compatible and can be mixed together; check also if connecting elements of hydraulic conduits are clean.
- To connect conduits to tractor's system properly observe recommendations of the manual of coupled machine.
- Observe and apply all warnings and recommendations located on shields and housings of coupled machines. If said warnings or information are incomprehensible, try to find explanation in manuals.
- Quick-release connectors should be fitted with suitable covers.
- If the external hydraulic system is utilised very intensively (high hydraulic pump delivery) for powering of coupled machines it is necessary to foresee more often oil replacement than it is recommended in tractor's manual.
- Keep cleanness while checking, replacing and replenishing the oil in the hydraulic tank (Fig. F-52).
- Use diesel fuel for washing of elements of the hydraulic system. Do not use water, water-soluble washing agents and compressed air.



WARNING:

1. INOBSERVANCE OF SAFETY & MAINTENANCE RULES GIVEN IN THE TRACTOR MANUAL MAY CAUSE WARRANTY VOID.
2. MODIFICATION OF HYDRAULIC EQUIPMENT WITHOUT CONSENT OF AN ASS OR A DEALER MAY CAUSE ALSO WARRANT VOID

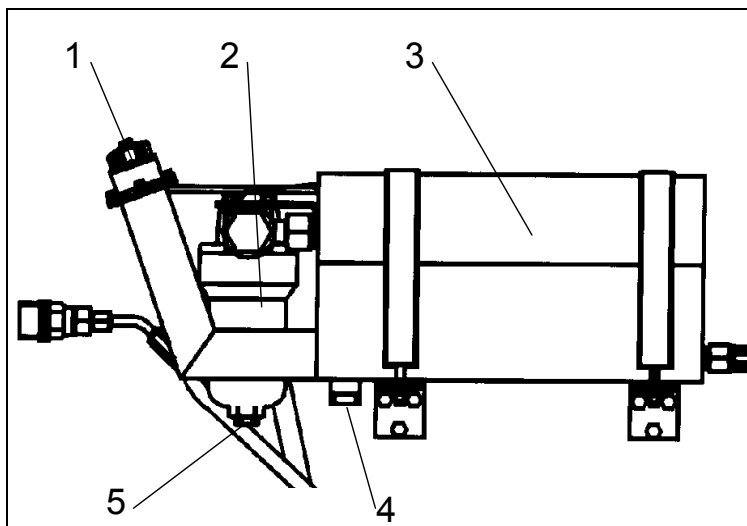


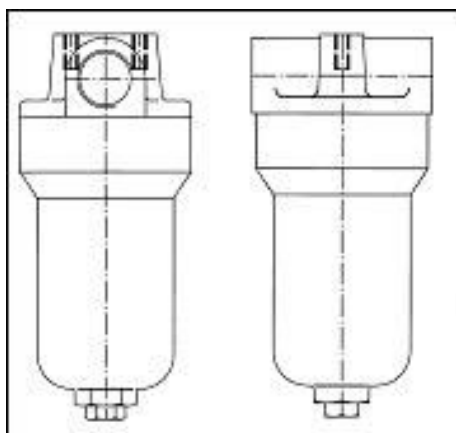
Fig. F-52. Hydraulic system tank.
1-oil filling plug + filter; 2- oil filter; 3- tank; 4- oil drain plug; 5- drain plug for removing of impurities from the filter.

Among maintenance actions of hydraulic system elements & parts the most important cleaning of the filtering element (insert) of the hydraulic oil filter.

The filter is situated near the tank under the right rear wing (Fig. F-52).

Always clean the insert when:

- system operation speed decreases significantly;
- system operation noise (pump) grows;
- oil contamination is visible;
- during every oil replacement.



To clean the filtering insert:

1. unscrew the lower part of the filter;
2. pull out the filtering insert;
3. wash, clean and wipe dry filter elements;
4. lubricate the sealing with oil and install new filtering insert
5. screw in the lower part of the filter.

Fig. F-53. Hydraulic oil filter

CAUTION:

1. ONE OF MOST IMPORTANT MAINTENANCE OPERATIONS IS CARE ABOUT SYSTEM TIGHTNESS, ESPECIALLY FLEXIBLE CONDUITS, CONNECTIONS, PLUGS ETC. DURING EACH OIL REPLACEMENT OR REPLENISHMENT.
2. IF THE SYSTEM IS LEAKY OR IF THERE IS AIR IN THE OIL PERFORM REPAIR IMMEDIATELY.
3. PRESENCE OF SOLID PARTICLES (E.G. SAND, METAL) SHOULD BE REMOVED BY WASHING IN PURE FUEL. IT IS PROHIBITED TO USE WATER FOR RINSING AND WASHING OF HYDRAULIC SYSTEM PARTS.

13. REAR THREE-POINT HITCH (RH)

Tractors PRONAR-320AM are fitted with a hitch category „II” according to ISO. Fastened machines (tools) are coupled (aggregated) in three points: articulated joints of lower pull rods (2 points) and through the upper pull rod (1 point).

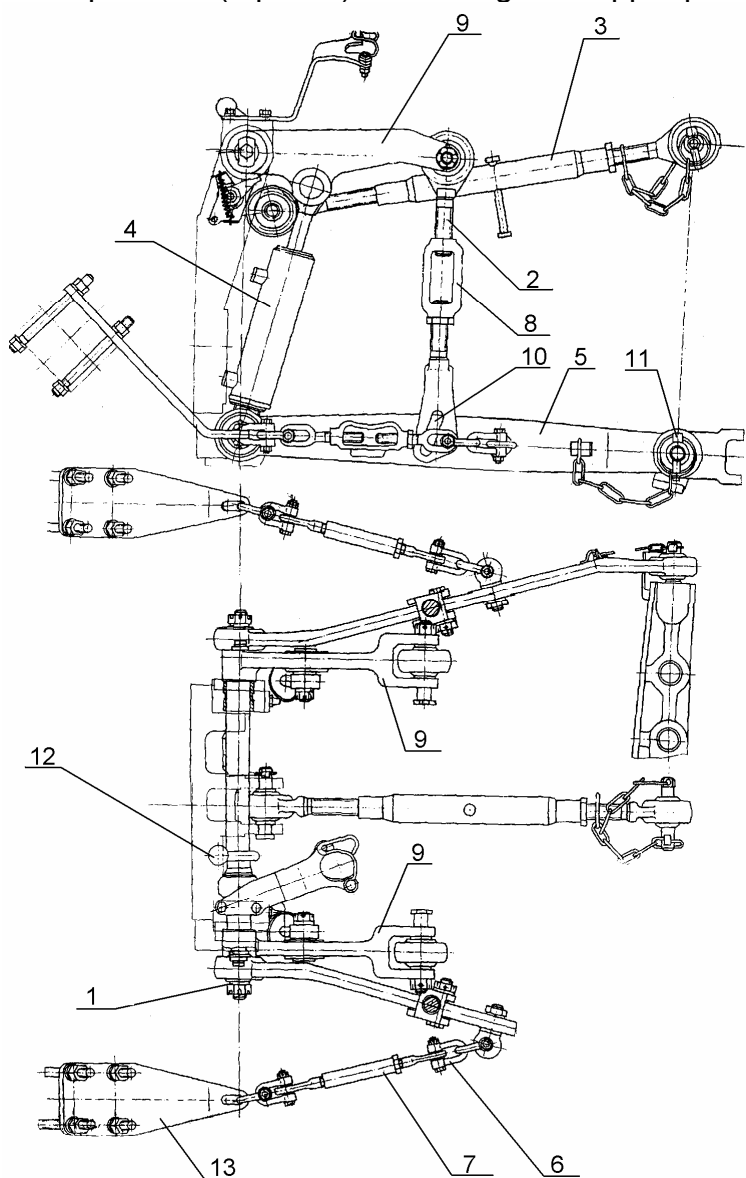


Fig. F-54. Rear hitch – general view

1- axle of lower pull rods; 2- hanger; 3- upper pull rod; 4- cylinder; 5- lower pull rod; 6- limiter; 7- eye bolt; 8- hanger adjustment screw; 9- hoist arm; 10- hanger beam-shaped opening; 11- cotter pin; 12- RH lock lever for transport purposes; 13- limiter bracket

RH is fitted with ball articulated joints of upper and lower pull rods with bolt openings:

- $\varnothing 28,7^{+0,33}$ mm for lower pull rods;
- $\varnothing 25,7^{+0,21}$ mm for upper pull rod.

Upper pull rod (POS.3 Fig.F-54)

The upper pull rod is fitted with two-sided tubular nut, which enables adjustment of its length.



WARNING:

DO NOT USE THE UPPER PULL ROD (AND ITS FASTENING BRACKET AS WELL) AS A TOWING CATCH.

Lower pull rods (POS.5, rys F-54)

While coupling tools / machines to lower pull rods first couple the left pull rod, because in the case of problems with the right pull rod the possibility of stepless adjustment of the hanger of right pull rod may be useful. The left hanger's length can be also adjusted steplessly.

Limiting chains (POS. 6 Fig. F-54)

The limiting chains mounted on both lower pull rods protect the tool while in transport position against side deflection and also prevent lower pull rod from rubbing against rear wheels.

Check if the chains are not twisted and fastened properly.

The limiting chains are fitted with a connector designed for changing the assembly length so that the position of lower pull rods can be altered, depending on category (ISO) of coupled machine.

The twist of connector enables matching of lower pull rods' spacing to dimensions of coupled machine.

Hangers (POS.2, Fig. F-54)

The hangers are designed for (proper) adjustment of position of lower pull rods while coupling the tractor with agricultural machines. Do not alter the length of the left hanger, which should amount to 400 mm. However, if there is such need, the length of the left hanger can be altered. Machines (tools) should be coupled with the tractor using possibility of adjustment of the right hanger length. By turning the adjustment screw 8 (Fig. . F-54) clockwise (as looking from above) we shorten the hanger, in the opposite direction – we lengthen it.

The RH hangers of subject tractor are fitted with two types of openings for fastening of lower pull rods:

- I option – cylindrical openings
- II option – oval openings (what gives the possibility of rearrangement of lower pull rods in relation to the hanger).

The first option should be used if we want to force with help of the hoist specific penetration depth of coupled machine's working organ.

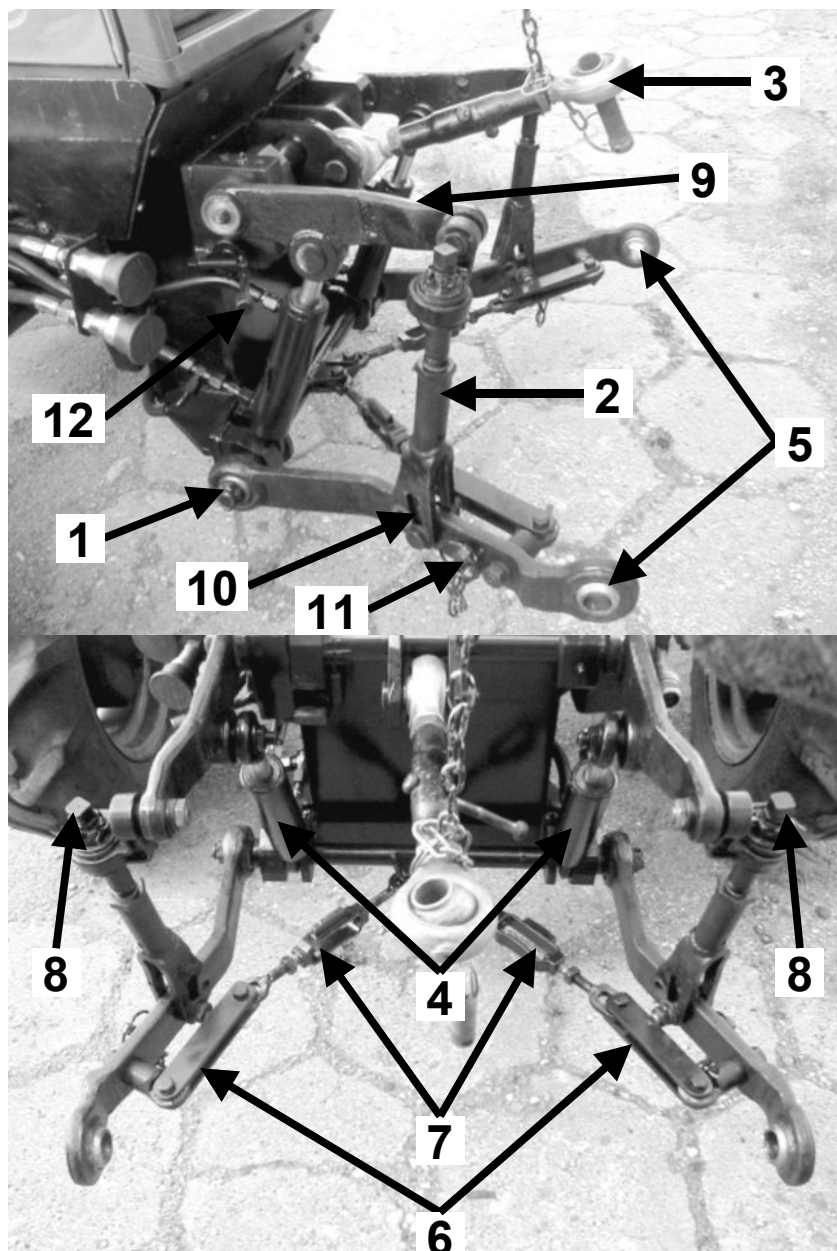
The second option allows to alter relative position i.e. compensation of relative motions. This is the thing of great importance while coupling with the tractor machines of considerable width (as measured in the plane transverse to the tractor's motion direction) or if coupled machine is fitted with a gauge wheels.

CAUTION: Each alteration of the hanger length requires readjustment of the limiter (POS.6, Fig. F-54.).

FRONT THREE-POINT HITCH (FH) (PRONAR-320AMK)

For special order tractors PRONAR-320AM can be equipped with a three-point hitch category „II” ISO in the front part of the tractor.

Coupled machines (tools) are connected (aggregated) in front of the tractor in three points: articulated joints of lower pull rods (2 points) (Fig.F-54a, POS.5) and through the upper pull rod (1 point) (Fig.F-54a, POS.3).



Front hitch RH is fitted with ball articulated joints of upper and lower pull rods with bolt openings:

- $\varnothing 28,7^{+0,33}$ mm for lower pull rods;
- $\varnothing 25,7^{+0,21}$ mm for upper pull rod.

Structure and adjustment of individual elements of the RH is the same as for the RH (see page 81).

Fig. F-54a. Front hitch – general view

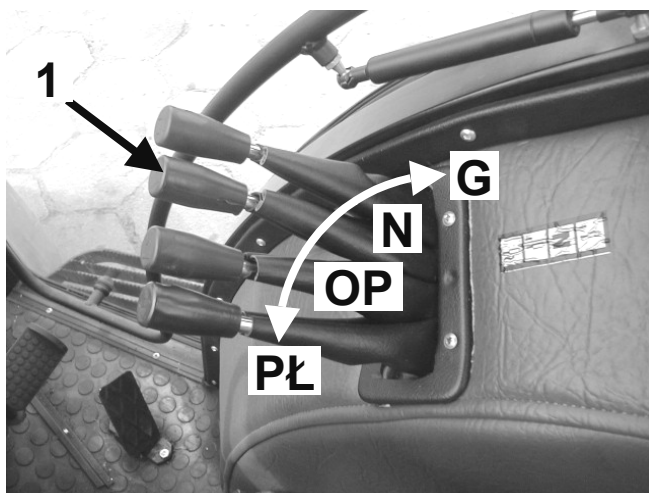
1- axle of lower pull rods; 2- hanger; 3- upper pull rod; 4- cylinder; 5- lower pull rod; 6- limiter; 7- eye bolt; 8- hanger adjustment screw; 9- hoist arm; 10- hanger beam-shaped opening; 11- cotter pin; 12- RH lock lever for transport purposes



WARNING:

DO NOT USE THE UPPER PULL ROD (AND ITS FASTENING BRACKET AS WELL) AS A TOWING CATCH.

Front hitch control



The front hitch is equipped with two cylinders (Fig.F-54a, POS.4) controlled with the four-section distributor, which lever 1 (Fig.F-54b) can be set in four positions:

- N- neutral
- G- raising
- OP- lowering
- PL- floating.

Fig.F-54b Controls of the front three-point hitch.
1- FH control lever

Operational principle of the distributor lever is the same as for other levers. Operational principle of the four-section distributor is described on the pages 76-77.

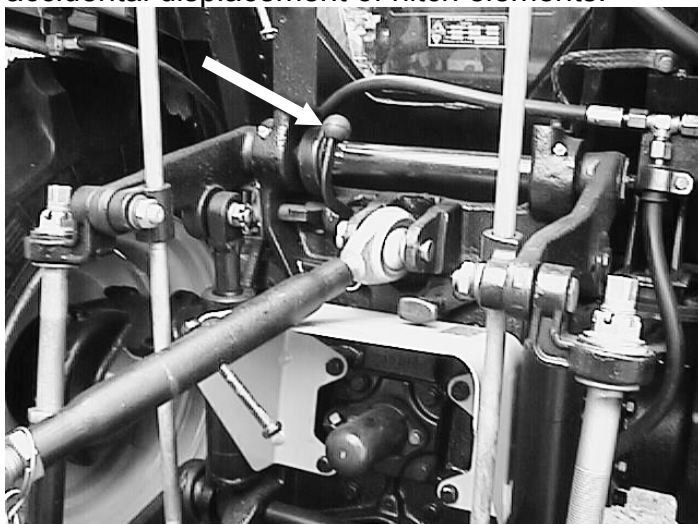


WARNING:

While transporting machines coupled with the front hitch secure mechanically arms from falling down with the lever 12 (Fig. F-54a). Such protection is recommended also while driving without coupled machines / tools.

PROTECTION DURING TRANSPORT / STOP

The hydraulic system should be protected during transport against damage or accidental displacement of hitch elements.



For this purpose:

- raise the catch and other FH elements RH to the highest position,
- move the lock lever (Fig. F-55) toward the tractor's front,
- check fastening conditions by pulling tool or FH elements down

Fig. F-55 FH shaft lock lever – fore position
– FH locked, rear position – lock released

14. LOWER TOW COUPLING (Fig. F-56) AND UPPER TOW COUPLING (Fig. F-56a)

The lower tow coupling is designed for towing of agricultural machines, single-axle trailers and car trailers. The coupling can be replaced in the vertical plane with use of a hoist. Spherical part of the bolt (6) is designed for coupling of a car trailer. While in transport position the coupling is locked with the bolt 9 (Fig. F-56) put in openings of the bracket (10) and the transverse beam (13) in the rear lower part of the rear PTS housing.

The upper tow coupling is designed for towing of two-axle agricultural trailers. The coupling is fastened with screws 24 and 25 (Fig. F-56a) to the rear axle body. To adapt the tractor for co-operation with the rear three-point hitch first remove the upper tow coupling by unlocking cotter pins 20 and removing bolts 3 (Fig. F-56a).

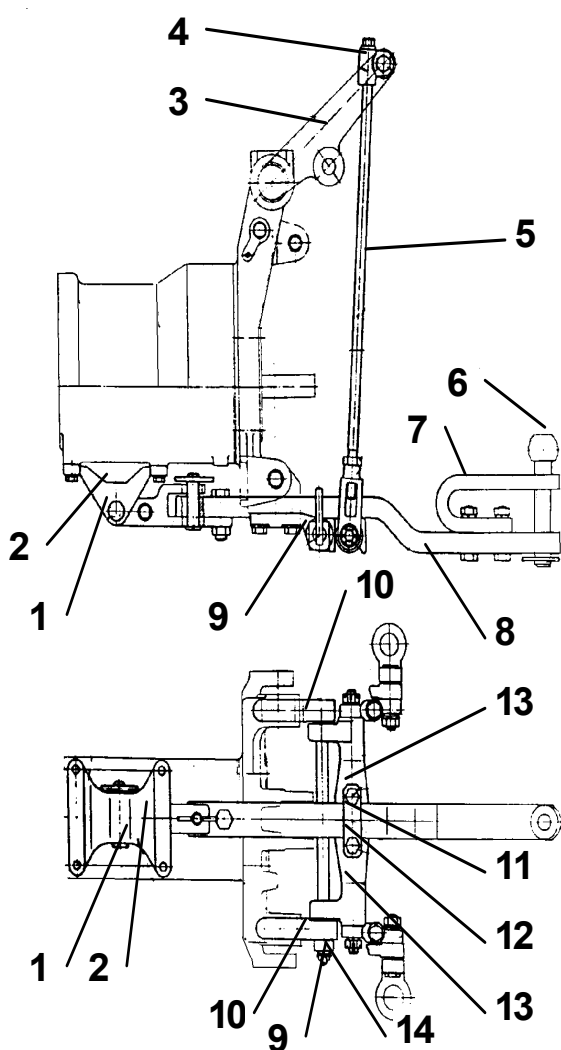


Fig. F-56. Lower tow coupling
1.bolt; 2.coupling bracket;
3. hoist arm; 4. eye;
5. raising pull rod; 6. bolt;
7. beam eye; 8. coupling beam;
9. bolt for locking in transport position; 10. bracket;
11. screw; 12. strap; 13. transverse beam; 14. spring

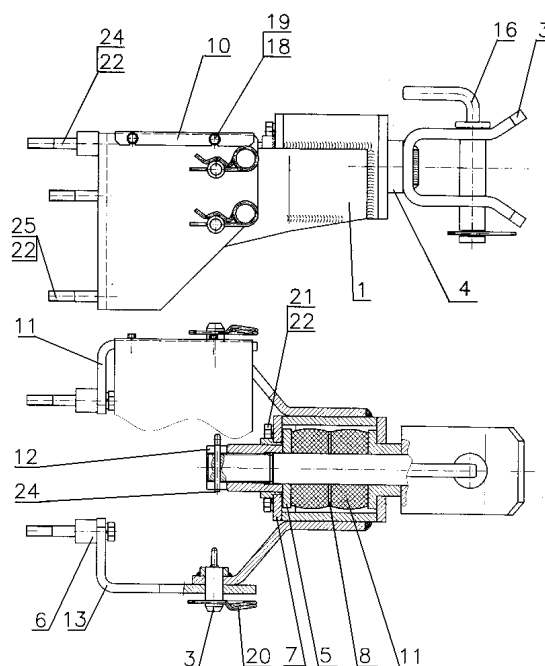


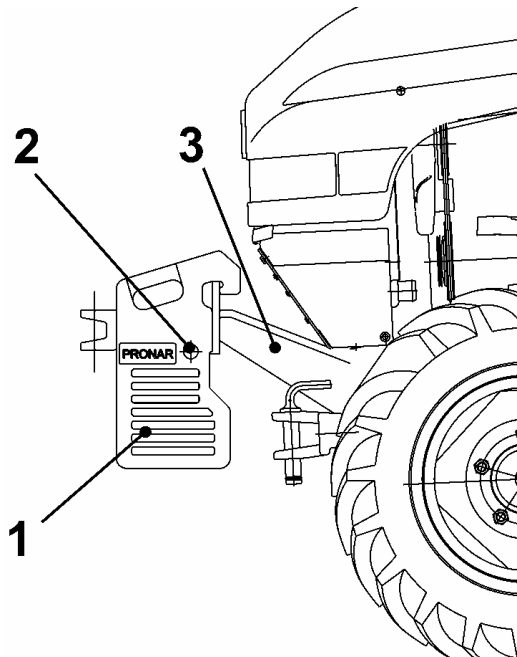
Fig. F-56a. Upper tow coupling
1. body; 2. bolt assembly; 3. pull rod; 4. sustainer; 5. sustainer; 6. washer; 7. clamp; 8. divider; 9. shock absorber; 10. shield; 11. bracket; 12. nut; 13. bracket; 15. bolt + cotter pin; 18. screw; 19. washer; 20. spring connector; 21. screw; 22. spring washer; 23. cotter pin; 24. screw; 25. screw

**WARNING**

Prior to each drive with a trailer (even if the trailer has been coupled with the tractor for longer time), the driver is obliged to make sure if the coupling works properly.

Use of damaged or inefficient couplings is strictly forbidden.

15. APPLICATION OF BALLAST



Additional weights can be installed to the bracket (POS.3, Fig. . F-57).

Fig. F-57. Front ballast 1- weight; 2- screw ; 3- bracket

**WARNING:**

DUE TO SIGNIFICANT MASS OF WEIGHTS TAKE SPECIAL PRECAUTIONS WHILE CARRYING THEM

CAUTION:

1. DURING HEAVY-DUTY OPERATIONS WITH THE TRACTOR, ESPECIALLY DURING TRANSPORTATION WORKS AND WHILE OPERATING CERTAIN MACHINES (DISC HARROWS, POTATO PLANTER) IN ROUGH TERRAIN IT IS NECESSARY TO INSTALL MINIMUM 4 WEIGHTS TO THE FRONT FRAME TO AVOID STEERABILITY LOSS OR TRACTOR'S OVERTURN.
2. WE RECOMMEND TO USE BALLAST ONLY IF IT IS REALLY NECESSARY.
3. HAVING INSTALLED BALLAST READJUST THE TYRE PRESSURE TO THE REQUIRED VALUE.

16. BRAKES (Fig. F-58)

Structure & operation

Tractors PRONAR-320AM are fitted with disc brakes (wet = working in oil). Brakes are controlled mechanically with separate pedals for right and left sides of the tractor.

Pressing the brake pedals causes – through the system of levers – dislocation of pressure discs 6, where the balls 7 displace toward outside of profiled grooves in pressure discs and expand them. Friction discs 5 and rear tractor wheels connected with brakes via rear drive half-axes become braked. The right brake pedal controls the brake valve of the trailer braking system (pneumatic).

Brakes are situated in bodies 4,9. The brake consists of friction discs 5, pressure discs 6, and intermediate discs 8. In the course of use friction linings wear thus it is necessary to readjust the pedal stroke periodically.

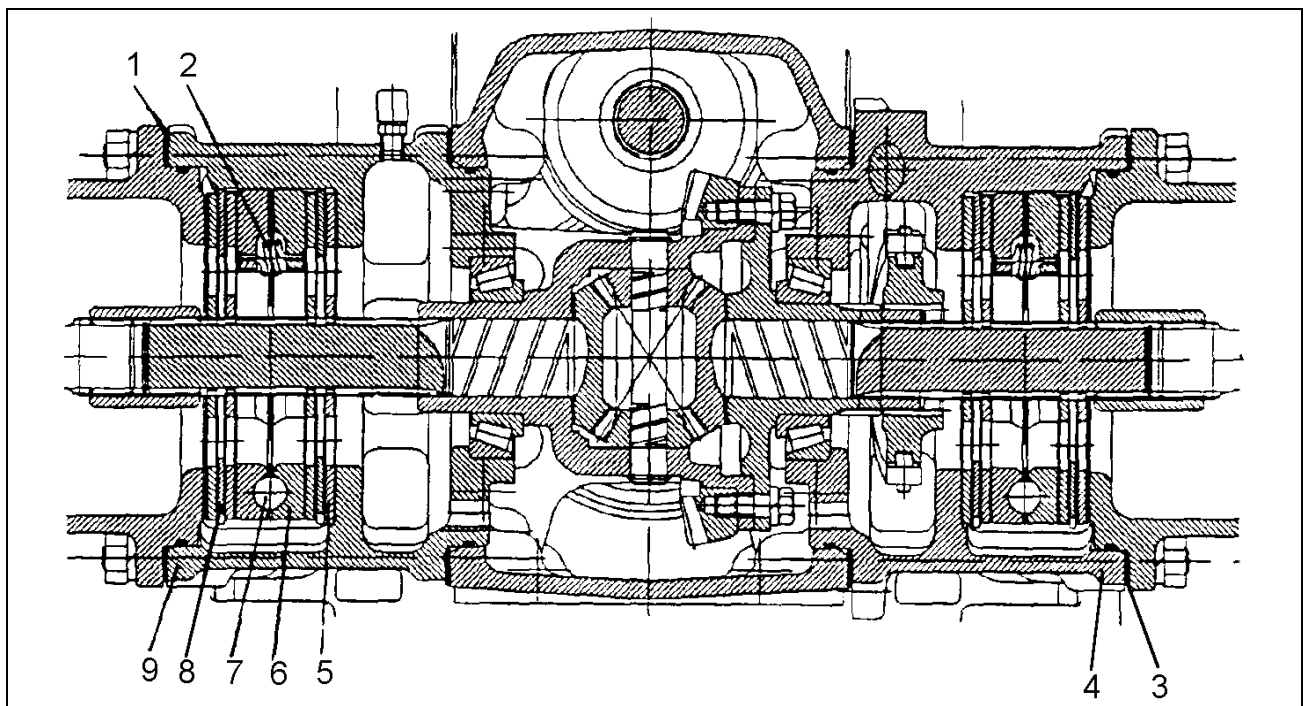


Fig. F-58 Main brake.

1,3- sealings; 2- spring; 4,9- bodies; 5- friction disc; 6- pressure discs; 7- ball; 8- intermediate disc

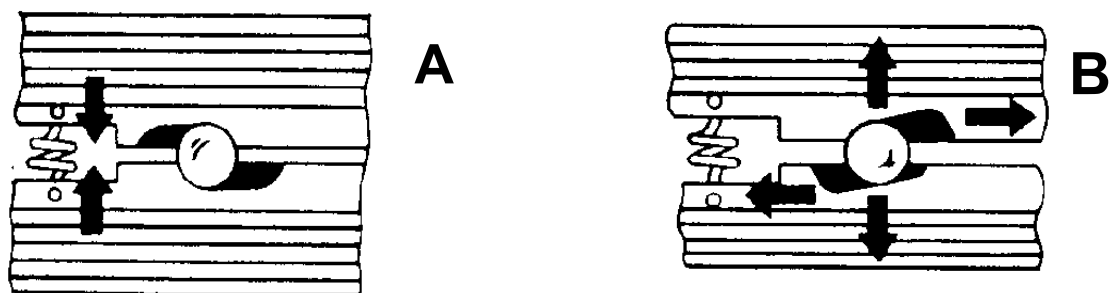


Fig. F-59 Disc brake operation principle A- rest position; B- operational position

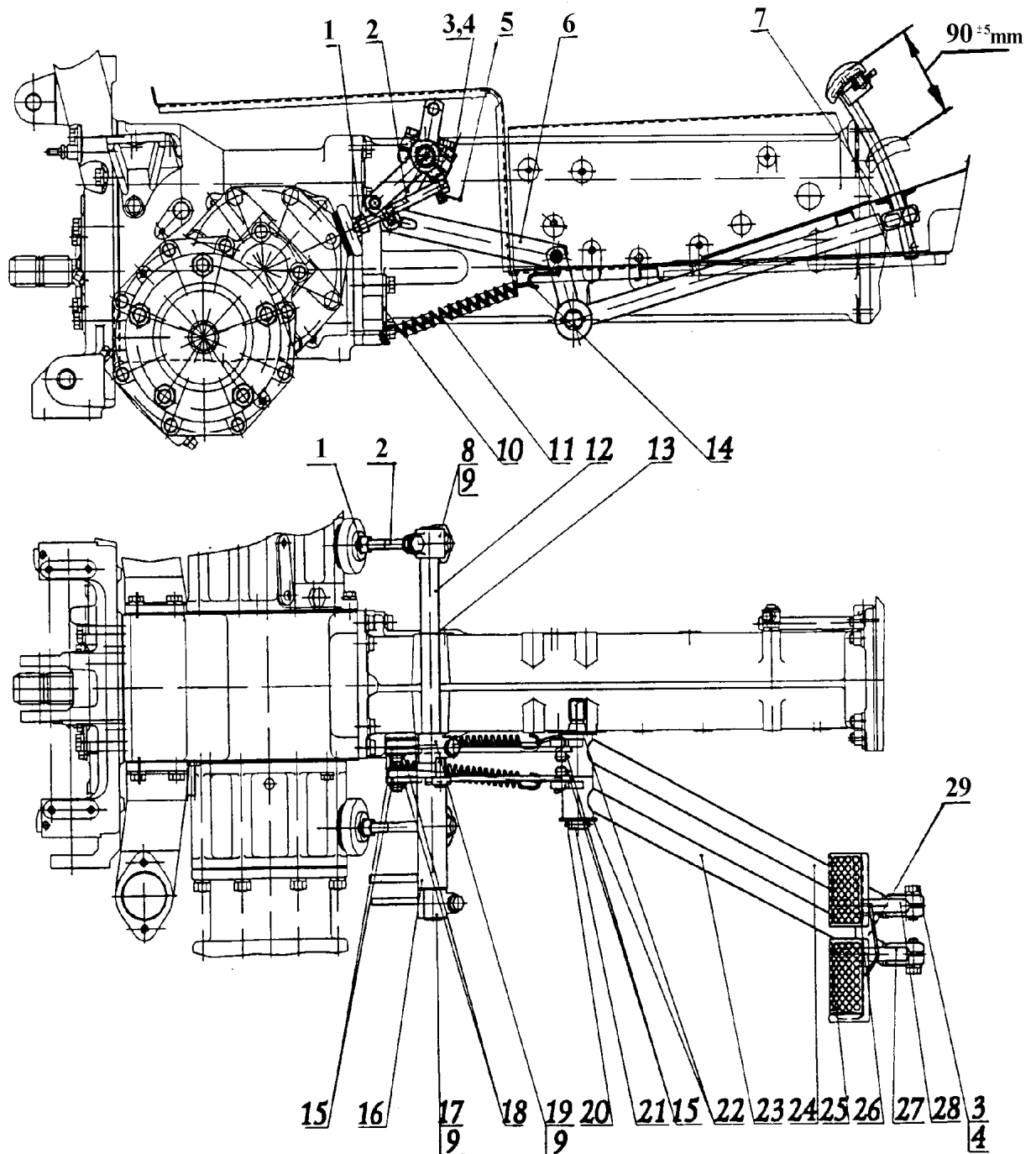
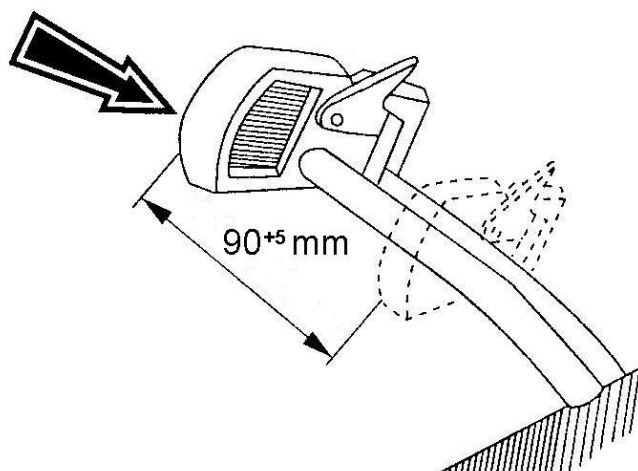


Fig. F-60. Main brake operation diagram

1- counter-nut; 2- adjustment screw; 3- screw; 4- washer; 5- spherical washer; 6- flat pull rod; 7- pedal sealing; 8- left lever; 9- key; 10- plate; 11- spring; 12- left brake shaft; 13- ring; 14- hook; 15- cotter pin; 16- right brake lever; 17- parking brake lever; 18- washer; 19- lever; 20- cotter pin; 21- axle of pedals; 22- washer; 23- right pedal lever; 24- left pedal lever; 25,26- rubber pedal straps; 27- right pedal; 28- left pedal; 29- pedals pawl

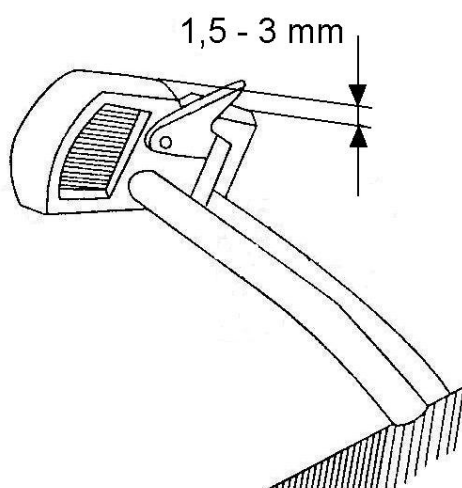
Main brake adjustment (adjustment of full pedal stroke)

We recommend to commence the adjustment of the main brake from the right wheel brake:



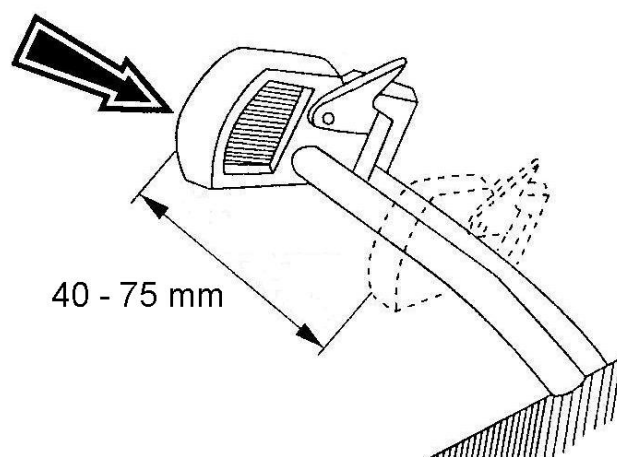
1. Loosen the counter-nut 1 (Fig. F-60)
2. Screw in or out the adjustment screw 2 until we obtain at the full right pedal stroke amounting to 90^{+5} mm – when pressed with force 120N (~12Kg) - Fig. F-61.
3. In the same way perform adjustment of the left brake pedal, but its stroke should be lesser by 5-10 mm than the right pedal stroke

Fig. F-61. Scheme – brake pedals – full stroke



4. Finish the adjustment when the height difference (upper position) amounts to - 1,5-3,0 mm - Fig. F-62
5. Tighten the counter-nut 2
6. Check brake operation. Unevenness of their operation (when coupled) must not exceed 1m of braking distance

Fig. F-62. Brake pedals. Height difference after adjustment.

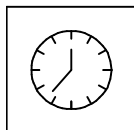


Properly adjusted brakes have the lost motion ca. 40 mm.
In the course of brake disc wear the lost motion may reach the value 75 mm. In this case:

1. adjust the brakes
2. check condition of discs if any problems concerning adjustment appear.

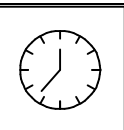
Fig. F-63. Brake pedal lost motion.

While coupling the tractor with trailers or other towed machines do not forget to connect the pneumatic system connector of the trailer brake unit to relevant lines in the tractor.



Lost motion and full stroke of pedals should be checked and – if necessary – adjusted every 125 mth.

Commission the replacement of worn brake discs to an ASS in the case if the braking power decreases significantly. The brakes should ensure tractor braking to stop at the distance of 9,5 m while moving 25 kph on dry asphalt (concrete) and the brakes are cold. The tractor must not change driving direction during braking by more than 0,5 m aside. The parking brake should keep the tractor standing on a slope 18% with a machine and 12% with a trailer. Unevenness of initial braking traces (when the coupled pedals are hardly pressed) must not exceed 1 m of braking distance.



CAUTION:

1. USE OF INDEPENDENT OPERATIONAL BRAKES SHOULD BE LIMITED EXCLUSIVELY TO SITUATIONS WHERE NECESSARY IS TO PERFORM A U-TURN WITH MACHINES COUPLED TO THE REAR HITCH.
2. COUPLE BOTH PEDALS WITH THE PAWL PRIOR TO ENTERING THE PUBLIC ROAD.
3. IF THE TRACTOR IS USED FOR OPERATIONS DURING STOP (EVEN FOR SHORT TIME) ALWAYS ACTIVATE THE PARKING BRAKE.

Parking brake adjustment (Fig. F-64)

The adjustment should be performed after finishing the adjustment of the main brake; the sequence is:

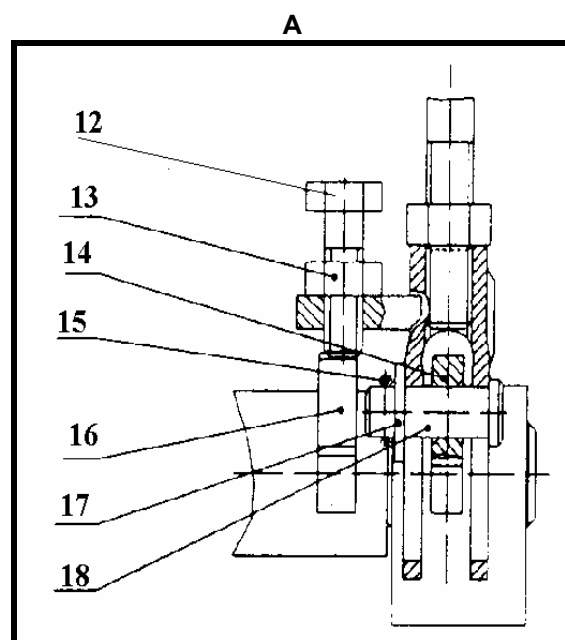
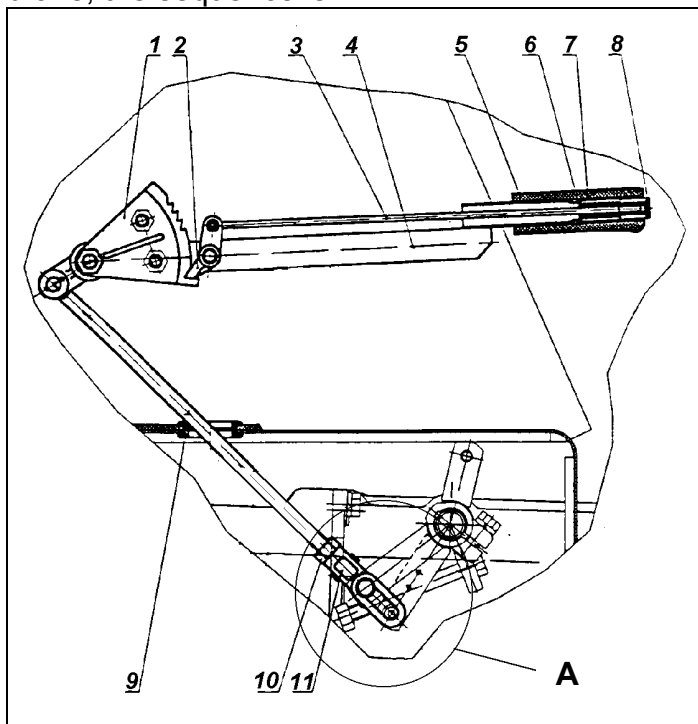


Fig. F-64. Parking brake.

1- toothed sector; 2- pawl; 3- pull rod; 4- brake lever; 5- handle; 6- washer; 7- spring; 8- pushbutton; 9- pull rod; 10- counter-nut; 11- fork; 12- adjustment screw; 13- counter-nut; 14- footbrake lever; 15- cotter pin; 16- footbrake lever; 17- washer; 18- bolt

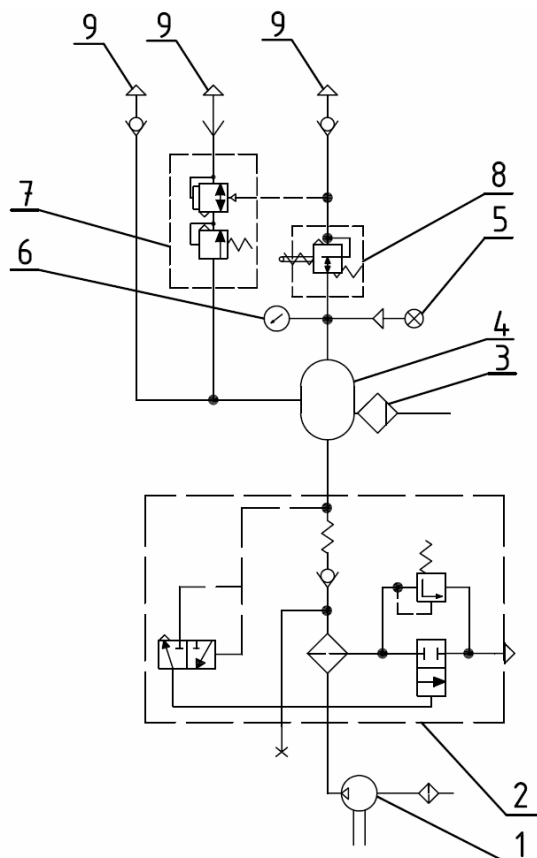
1. Set the lever 4 to the extreme lower position (see Fig. F-64).
2. Loosen the counter-nut 10
3. Remove the cotter pin 15 and the bolt 18.
4. By turning the fork 11 match the opening in the lever 14 to upper surface of the bean-shaped opening in the fork.
5. Screw the bolt 12 in until it comes into contact with the lever 16.
6. Draw the parking brake lever with the force 200N. The pawl 2 should mesh with one of protrusions of the toothed sector 1. Otherwise repeat the adjustment with use of the fork 11 and the screw 12.
7. After adjustment secure the bolt 18 with the cotter pin 15 and tighten the counter-nuts (10,13).

CAUTION:

1. WHEN THE LEVER IS SET TO THE LOWER EXTREME POSITION (BRAKE OFF) THE PUSHBUTTON 8 SHOULD PROTRUDE FROM THE HANDLE 5 NOT LESS THAN 5mm.
2. FOR THE PURPOSE OF TRACTOR'S SAFE OPERATION COMMISSION THE BRAKE INSPECTION TO AN ASS.

The parking brake should keep the tractor with fully loaded trailer (equipped with brake system) standing still on the 12 % slope.

17. PNEUMATIC SYSTEM



The combined trailer braking pneumatic system (double- and single-conduit) consists of a compressor driven by the engine, an air tank, control valves and three pneumatic connectors. The connectors are installed in the rear of the tractor and can be connected to a single- or a double-conduit trailer braking system. The pneumatic connectors have three various colours: black, red and yellow. The black connector is used for a single-conduit system, and the red (supply) and the yellow (control) – for a double-conduit system.

Fig. F-65. Pneumatic system

1- compressor; 2- pressure controller; 3- drain valve; 4- air reservoir; 5- air pressure warning light; 6- manometer; 7- trailer control valve; 8- control valve; 9- pneumatic connection;



There are various types of trailer braking system. Prior to connection to tractor's pneumatic brake system read the trailer's manual.

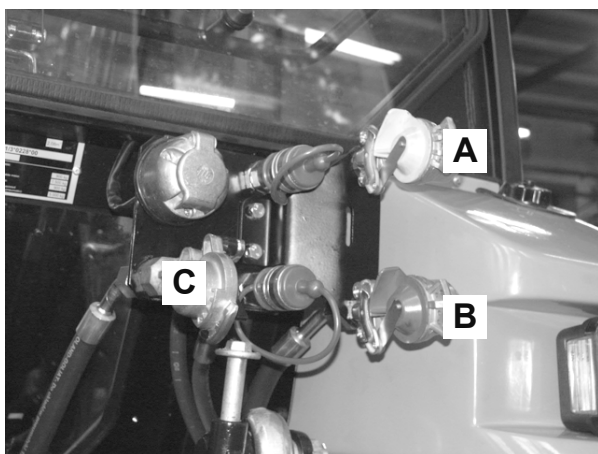


Fig. F-66. Pneumatic system connectors.

A- yellow connector (double-conduit system)
B- red connector (double-conduit system)
C- black connector (single-conduit system)

CAUTION: Trailer brakes work only when both tractor's brake pedals are pressed, thus both pedals should be coupled with the latch, if the tractor is connected to a trailer.

Tractor's parking brake is connected to the main control valve. When the parking brake is activated, activated are also trailer brakes.

Trailer's single-conduit system

If the trailer is fitted with a single-conduit system, connect trailer's pneumatic conduit to tractor's black pneumatic connector **C (Fig.F-66)**. When brake pedals and the parking brake lever are released, pressure in the connector amounts to 0.62 MPa. Activation of tractor brakes causes pressure drop proportional to the pressure on brake pedals, thus activation of trailer brakes.

Trailer's double-conduit system

If the trailer is fitted with a double-conduit system, connect trailer's supply conduit to the red connector **B (Fig.F-66)**, and the control conduit – to the yellow connector **A (Fig.F-66)**.



The double-conduit system works only when both conduits are connected to red and yellow connectors.

Supply conduit (red) – the conduit for filling trailer's pneumatic tank. If for some reason trailer's brake system would be disconnected from the tractor, the pressure drops to zero and trailer brakes become activated.

Control conduit (yellow) – when tractor's brakes are activated, increased air pressure is supplied through the yellow to trailer's control valve, until the system pressure reaches its working value. Trailer braking force is proportional to the pressure on tractor's brake pedals.

Preparation for use

- check completeness of the system;
- connect air conduits both tractor and trailer together;
- check brake operation during stop & drive;
- adjust the initial point of brake valve operation – if braking of the tractor and the trailer does not occur simultaneously.

Start the engine and release both (main and parking) brakes. The lamp indicating pneumatic system pressure drop goes on (**pos. 10; Fig. C-1**), until the pneumatic system pressure grows to ca. 0.5 MPa. When the pressure reaches the value of 0.55÷0.8 MPa indicated at the air pressure gauge (**pos. 5; Fig. C-1**), will be heard a loud sound of air released through the valve to the atmosphere.

Press the brake pedals a few times making sure that the pressure indicated by the gauge drops when the brakes are activated and grows, when released.



Do not drive with the tractor, when the trailer's brake indicator lamp is on.



Prior to connection of conduits clean trailer and tractor connectors. Make sure that all connections are secured. Check trailer brakes regularly, to make sure that they operate properly.



Do not overuse brakes at slopes of great inclination. Use the same gear as when driving uphill with the same inclination.

MAINTENANCE & OPERATION

The maintenance consists in:

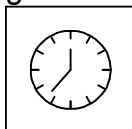
- performing the operations of daily maintenance (check also fastening of all elements of the pneumatic system);
- performing the operations of periodical maintenance of individual components and checking the system tightness;

Checking the system tightness (every 250 mth):

- after the engine has been stopped the pneumatic system pressure drop – when the main & parking brakes are off – should not exceed 0,0126 MPa for next 10 min. as measured with a manometer in the pneumatic connection 7 (Fig. F-65). It is admissible to check the tightness for 10 minutes if the pressure drop indicated on the manometer situated at the instrument panel is not greater than 0,0126 MPa.
- during tightness check the pneumatic installation of the trailer must not be connected to the trailer's pneumatic system (= must be relieved).

COMPRESSOR

The compressor is driven by the V-belt from the crankshaft. Compressor is splash-lubricated. The compressor may be on only during towing a trailer, pumping of air-tubes and utilisation of compressed air for painting. To uncouple the compressor remove the shield and the V-belt: for this purpose loosen the compressor shield fastening screws, shift the compressor towards the engine, remove the V-belt and tighten compressor fastening screws.



Check daily the oil level in the body; the proper level should reach the line on the dipstick but must not be lower than up the end of the dipstick.

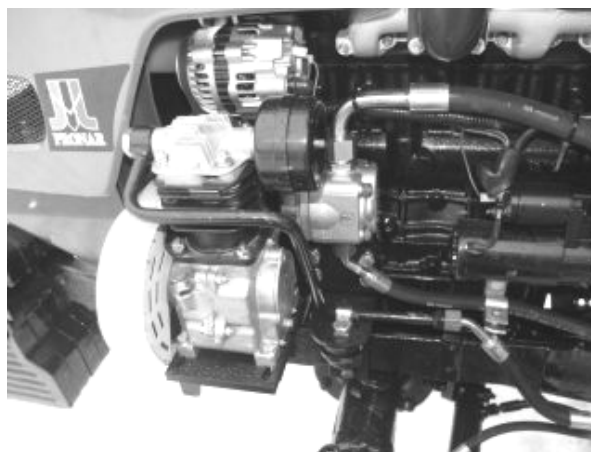
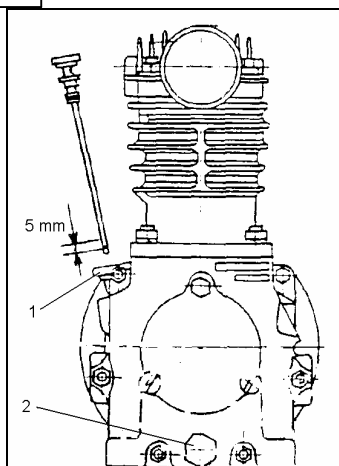
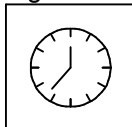
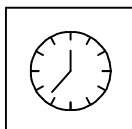


Fig. F- 67 Compressor oil level inspection 1- inspection/filling plug; 2- drain plug



First oil replacement should be performed after 50 mth (warranty inspection).

Next oil replacements after each 250 mth. Use currently utilised engine oil.



Every 125 mth check V-belt tension by pressing it manually with the force of ca. 40N in the half distance between pulleys. If the belt deflection is greater than ca. 10mm, adjust the tension by shifting the compressor away from the engine. Caution: a new V-belt lengthens sooner than the used one.

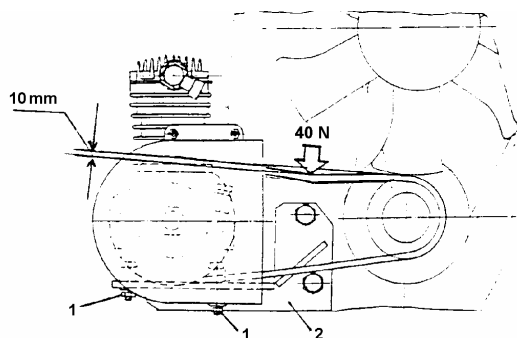
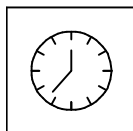
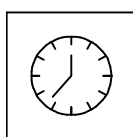


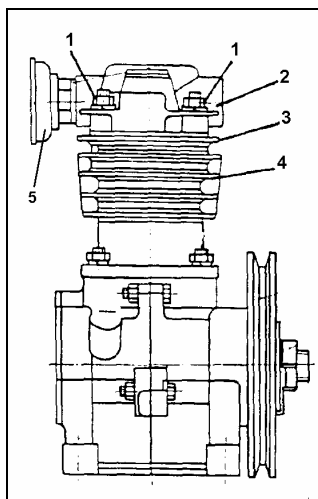
Fig. F- 68 Compressor V-belt tension inspection. 1- screws; 2- bracket.



Every 125 mth and when the dustiness is very high every 10 hrs clean the air filter 5 (Fig. F-69) i.e. wash the filter in diesel, blow with compressed air and lubricate the clean component with engine oil.



Every 500 mth check condition of valves (first remove the head) and replace them, if necessary. Wash the valves with kerosene.



Sequence of disassembly of valves (Fig. F-69):

- unscrew the nuts 1;
- remove the head 2 together with adapter 3;
- remove the plate suction valve between the adapter 3 and the cylinder 4;
- disconnect the adapter 3 from the head 2
- unscrew the screw fastening the spring;
- remove the plate blow out valve
- clean, wash and blow with compressed air the compressor head, adapter, piston bottom and valves.

Fig. F- 69 Valve condition inspection.

1- screws; 2- compressor head; 3- adapter; 4- cylinder; 5- compressor air filter

AIR PRESSURE CONTROLLER

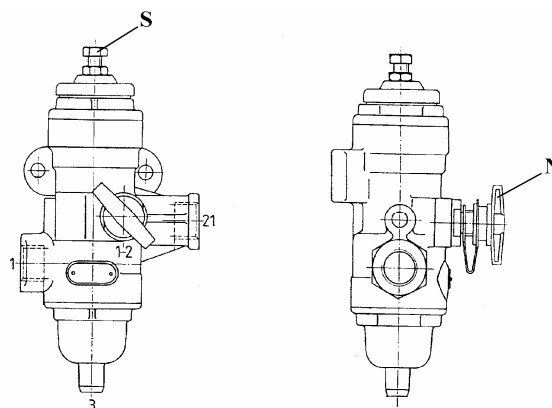
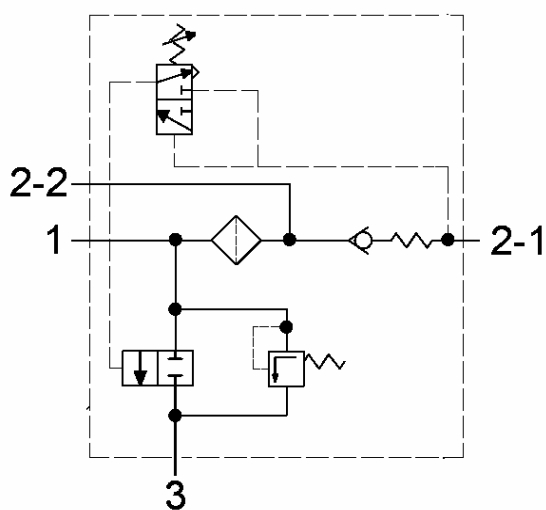


Fig. F-70 Air pressure controller.

S- air pressure adjustment screw (sealed); N- connector + protection nut

Designation:

The controller is designed for keeping the brake system pressure within requested range. The controller is fitted with integral safety valve, which protects the pressure system against excessive pressure increase in the reservoir. The controller is fitted also with a air filter, which cleans the air from solid impurities. The controller is equipped with the connector for pumping the air-tubes enabling pumping of tractor wheels from tractor's compressor.

Operation:

The air is pumped from the compressor to the connector **1**, then through the filter to the connector **2-1** and to the air reservoir. Increasing pressure in the inlet connector **2-1** operates the control piston held by the spring, which pressing force can be adjusted with the screw **S**.

When the pressure in the connector **2-1** reaches required value the controller become switched over in such way that the excessive air pumped by the compressor is blown out from the connector **1** through the vent **3** to the atmosphere.

If as the result of normal air consumption by brake valves the pressure falls below the required value, the control piston controlling the spring tension switches over the controller so that the air from the connector **1** will be pumped to the connector **2-1** and then to the system, cutting off tightly the vent **3**. Because – in many cases – the compressor works continuously, the controller will work cyclically depending on air demand, until it reaches so-called activation pressure. Then it will be switched over to replenish the system pressure.

The safety valve is integral with the system in such way that if the pressure increases above the set value – as the result of control piston damage – the valve opens and the air from the connector **1** flows out through the connector **3** to the atmosphere, protecting other system elements against excessive pressure increase.

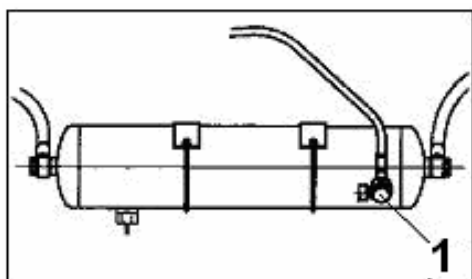
To use the connector for pumping the wheels first remove the protection nut and screw in a hose with proper end. The push rod will switch over the controller in such way that the air from the compressor does not flow to the connector **2-1**, but via the open valve, connector **2-2** and hose is pumped to tyres. Check tyre pressure value with a manometer and disconnect the tyre from the connector, when the pressure reaches required value.

Maintenance:

Depending on operational conditions it is recommended to disassembly the lower housing and wash the bronze sinter filter ca. 2-4 times yearly. The filter should be washed with petrol or dissolvent and blown with compressed air. Dry filter can be mounted again to the controller. Besides the controller does not require special maintenance during operation. For repair use the repair kit 51100072.

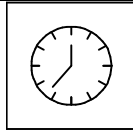
The repair must be performed in an ASS for products of the POLMO Praszka according to the Repair Manual.

AIR RESERVOIR (POS.4, Fig. F-65)



The reservoir is situated on the left tractor's side just nearby the rear wheel. In the scope of maintenance works check air reservoir fastening. If we find any breaks, dents etc. the reservoir must be replaced immediately.

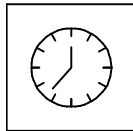
Fig. F-71 Air reservoir. 1- air pressure drop sensor



Every 1000 mth (or once a year) clean the reservoir thoroughly. We recommend to perform this operation in an ASS. Every 10 mth remove the condensate from the reservoir with help of the drain valve 3 (Fig. F-65).

BRAKE VALVE (FOOT-OPERATED)

The brake valve is designed for activation of trailer brakes. It is activated with the right footbrake pedal.



Readjust the brake valve every 250 mth.



READJUST THE BRAKE VALVE AFTER EACH TRACTOR BRAKES ADJUSTMENT

Adjustment:

- press the lever of coupled brake as far as it will go and measure the projection of the brake valve mandrel; this should amount to 5 mm. If the value is greater or lower readjust the brake valve (Fig. F-73):
- loosen the counter-nuts 5;
- screw in the adjustment screw 4 into the pull rods 6 if the mandrel projection is smaller than 5 mm or screw it out if the mandrel projection is greater than 5 mm;
- tighten the counter-nuts 5

The parking brake should also cause the mandrel projecting by 5 mm when fully braked. Check the correctness of adjustment during test drive with trailer. Properly set brake valve should cause simultaneous braking of both tractor and trailer or braking of the trailer with slight advance (0,2 sek.) in relation to the tractor.

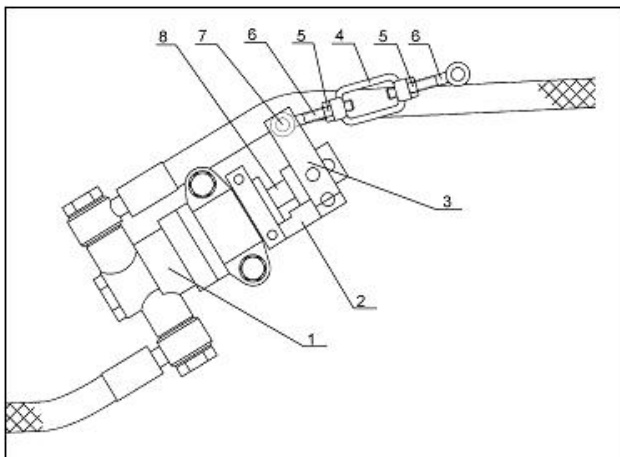


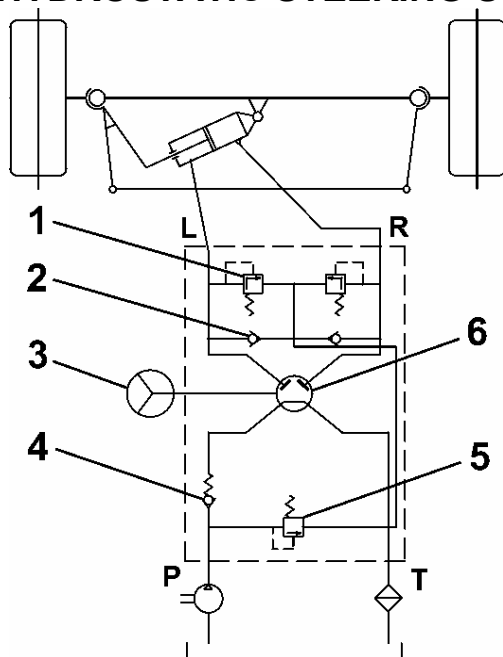
Fig. F-73. Brake valve adjustment
1- brake valve; 2- brake valve lever; 3- arm; 4- adjustment screw; 5- securing nuts; 6- pull rod; 7- bolt; 8- valve mandrel

CAUTION:

Correct adjustment of both main and parking brakes facilitates adjustment of the lever position of the trailer brake valve lever. The brake valve should be adjusted if:

- the trailer brake operates too soon,
- the trailer brake operates too late,
- the parking brake does not activate the trailer brakes.

18. HYDROSTATIC STEERING SYSTEM



The hydrostatic steering system is the standard equipment of PRONAR-320AM tractors. It is designed for reduction of force at the steering wheel. Both design and functional diagrams are shown below (Fig. F-74, Fig. F-75).

Fig. F-74 Control block „Orbitrol” – design diagram.

1- anti-shock valve; 2- anti-vacuum valve; 3- steering wheel; 4- check valve; 5- safety valve; 6- control section; R- right cylinder chamber, L- left cylinder chamber, T- drain, P- pump

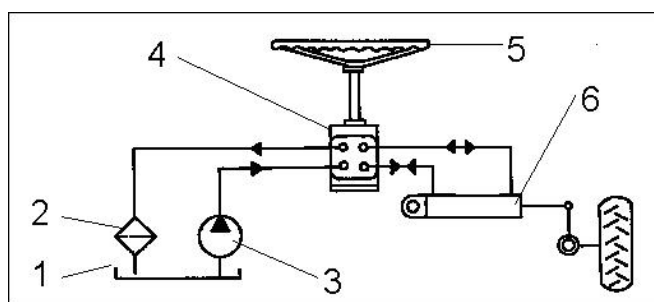
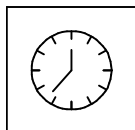


Fig. F-75 HSS – functional diagram.

1- oil tank; 2- oil filter; 3- oil pump; 4- control block „Orbitrol”; 5- steering wheel; 6- hydraulic cylinder;

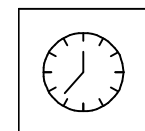


Check the oil level in the tank daily. The oil level should be 1 cm above the bottom of the oil filler sieve filter

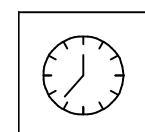


CAUTION:

DO NOT OPERATE THE TRACTOR IF THE TANK CONTAINS INSUFFICIENT OIL VOLUME OR IF THE SYSTEM IS LEAKY.



Check the steering system play every 250. The play should not exceed 25° if the engine is on.

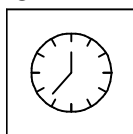


Replace the oil in the HSS/H tank every 1000 mth; after oil replacement vent the system.

STEERING SYSTEM DEAERATION:

- check and tighten – if necessary – connectors of the hydraulic system (on all conduits);
- replenish the oil level, as during filter replacement, screw in the filler plug;
- start the engine and keep rpm in the range $1000-1200 \text{ min}^{-1}$ for ~30s;
- turn the steering wheel in both directions until front wheels become fully twisted;
- stop the engine and replenish the oil up to the edge of the filler plug (when the foam falls down);
- repeat above mentioned operations until the idle motion of the steering wheel (caused by air in the system) will be completely eliminated;
- set the wheels straight forward when the engine is on;
- after 30 s switch off the engine;
- check the oil level in the pump tank, replenish if necessary, close the plug;
- carefully remove spilled oil and wipe the connectors dry;
- start the engine and set rpm to $\sim 1800 \text{ min}^{-1}$ and turn the steering wheel in both directions until obtaining full twist of front wheels, check operation of the excess valve and keep in this position (when the excess valve is activated) for 10 s 3 times in each extreme position;
- switch off the engine, check tightness of connections; in the case of leakage tighten connections and repeat test till the system will be completely tight;
- the system should work smoothly in the whole operational range; any jams, seizures or jerks of the steering wheel are inadmissible. The system must not be “soft”; all symptoms of aeration or vibration of conduits must be eliminated.

19. WHEELS & TYRES



CAUTION:

Check fastening of wheels and nuts every 125 mth (front wheels - 150 Nm, rear wheels - 200 Nm). Check & adjust tyre pressure every 125 mth.

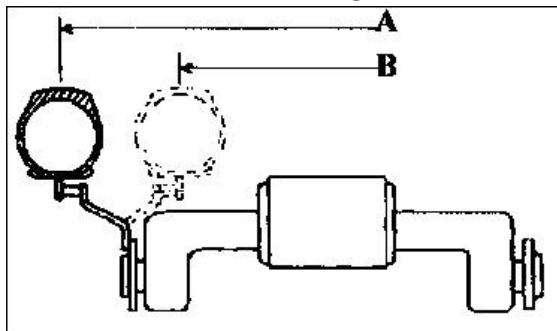
Observation of below given principles allows maximum extension of tyre life during its operation:

- a) tyre pressure – depending on load – should be within the range given in the table below. If the tyre pressure – in relation to wheel load – is too low, appears the phenomenon of tyre “waving”, which leads to quick tyre destruction.

Tyre dimension	PR	Admissible load (kG) depending on tyre pressure (MPa)											
		0,8	1,1	1,2	1,4	1,5	1,6	1,7	1,8	1,9	2,0	2,1	2,2
210/80-16	4	350	415	480	540	565	590	615	640	663	685	708	730
11,2x20	8	580	700	750	795	840	863	885	926	965	988	1010	1050

- b) keep out oil, grease and artificial fertilisers (especially these of acid reaction) from tyres (to protect rubber against destruction).
- c) small defects and damages of tyre side walls should be vulcanised immediately; this allows extension of tyre life.
- d) to ensure high ploughing efficiency do not use tyres worn more than by 1/3 to 1/2 tyre tread height.
- e) always install on both sides tyres of the same separator number and tread pattern. Do not use diagonal and radial tyres simultaneously.

WHEEL TRACK CHANGE



Wheel track of front and rear wheels of the PRONAR-320AM tractor can be changed by changing their places i.e. left wheels are installed on the right side and reverse – this is necessary for proper thread orientation. Wheel track scheme is shown on the Fig. F-76.

Fig. F-76 Front & rear wheel track change.

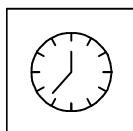
FRONT WHEEL TRACK CHANGE:

- loosen screw connection disc - hub,
- place wedges under the rear wheels and with help of a hoist raise front part of the tractor (so that they do not touch the ground),
- remove the complete wheel from the hub and then install on the opposite tractor's side.

REAR WHEEL TRACK CHANGE:

- the same operations as above but :
- place wedges under front wheels
- raise with a hoist the rear axle.

CAUTION: keep the same orientation of tyre treads.



After wheel track change retighten twice (every 10 mth; in the case of heavy-duty works every 2 mth) wheel screw connections. (Fig. F-79)

ADJUSTMENT OF FRONT WHEELS TOE-IN

After each replacement of front wheels and every 250 mth check and readjust if necessary the toe-in of front wheels. The toe-in is measured at wheel edges (rims), at the height of the front wheel hub and behind the front axle (the difference between dimensions B and A - Fig. F-77. should be within the range 0-5 mm).

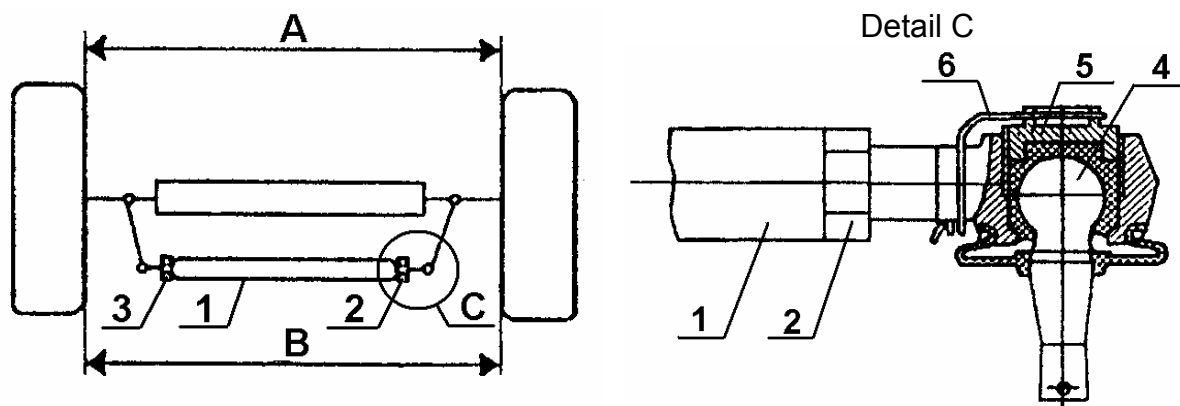


Fig. F-77 Adjustment of front wheels toe-in

1- steering rod; 2,3- counter-nuts (2 szt.); 4- ball joint. 5 - stone, 6- securing wire
A i B – measured values, „C” - detail – articulated joint + rod end

Correct toe-in of front wheels ensures parallel positioning of front wheels during straight-line drive, what reduces rolling resistance and prevents quick wear of tyres.

To adjust the toe-in:

- leave the tractor on even, hard, level ground with wheels set straight ahead;
- eliminate play:
 - in articulated joints of the steering system by screwing in the stone 5 (Fig. F-77) of the joint; first remove the securing wire 6 (Fig. F-77)
 - in fastening of the steering system cylinder by tightening the nuts of all bolts
 - in fastening of steering arms to knuckles; check if the screws fastening the knuckle are tightened
- adjust play in front wheel hubs
- adjust tyre pressure in all wheels
- with help of a rule check the toe-in by measuring the dimension A on the height of wheel axle and the dimension B at the same height when the tractors travels such distance that the measuring points A change their position by 180°;
- if the toe-in is incorrect adjust it with the rod 1 (Fig. F-77):
- unscrew the nuts 2 i 3 (loosen) (Fig. F-77) and by turning the rod 1 change the toe-in so that the difference between B and A lies within the range 0-5 mm
- tighten the counter-nuts 2 i 3 (Fig. F-77)

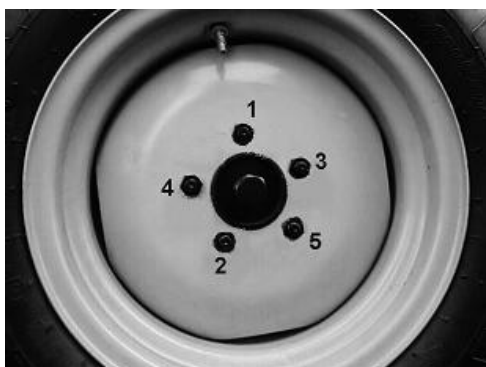


Fig. F-79 Sequence of tightening of wheel nuts.

20. WIRING SYSTEM

The wiring system is supplied with 12 V voltage; the negative pole is connected to the frame (see enclosed wiring diagram).

Maintenance of the wiring system consists in periodical inspection of connections and condition of insulation.



WARNING:

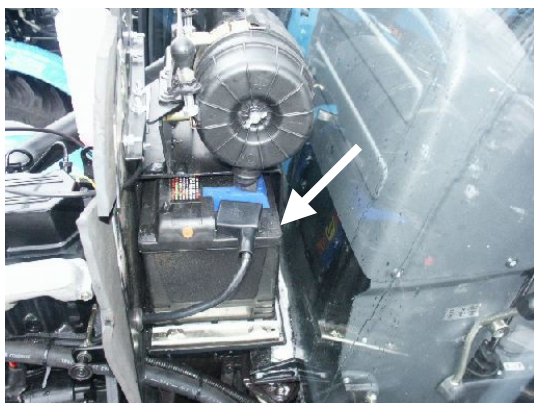
1. WHILE DISCONNECTING BATTERY CONDUCTORS FIRST DISCONNECT THE NEGATIVE CONDUCTOR (-), WHEN CONNECTING – FIRST CONNECT THE POSITIVE CONDUCTOR (+)
2. DURING ARCH WELDING OF ELEMENTS OF THE TRACTOR OR COUPLED MACHINE DISCONNECT THE ALTERNATOR CONDUCTORS AND DISCONNECT THE FRAME WITH RELEVANT SWITCH; THE ENGINE MUST BE OFF.



WARNING:

IT IS PROHIBITED TO CONNECT OR DISCONNECT BATTERY OR ALTERNATOR CONDUCTORS WHEN THE ENGINE IS ON; THIS MAY CAUSE DESTRUCTION OF ELECTRIC EQUIPMENT

BATTERY

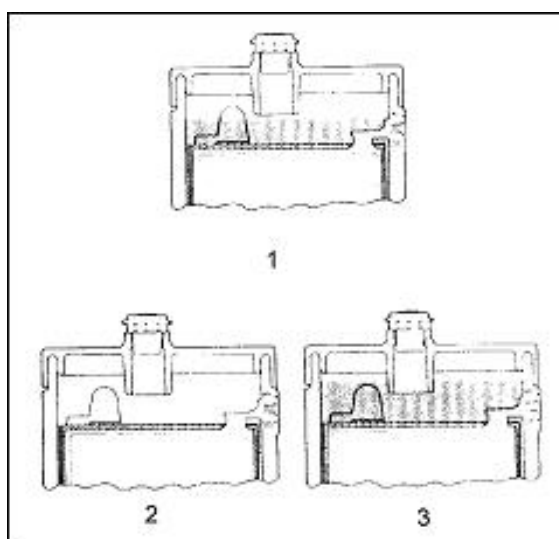


The battery is installed under the bonnet near the operator's cab Fig. F-80.

Fig. F-80. Placement of the battery



Check battery electrolyte level every 125 mth or every two weeks in the summer / every month in the winter.



The battery consists of 6 cells installed within common housing. Electrolyte replenishment openings are closed with screwed-in plugs. The electrolyte level in each cell should be 8-10 mm above separators i.e. walls between individual cells. Correct electrolyte level is shown on the figure F-81.

Fig. F-81 Battery electrolyte level:
1- correct; 2- to low; 3- to high;

Battery charge level can be checked on the basis of electrolyte density assuming that at 100 % charge level the density amounts to $1,28 \text{ g/cm}^3$. Battery discharge above 50% ($1,19 \text{ g/cm}^3$) in the summer and 25% ($1,24 \text{ g/cm}^3$) in the winter is inadmissible. The battery should be charged with help of a rectifier until correct electrolyte density is obtained. Remove the battery from the tractor for charging.

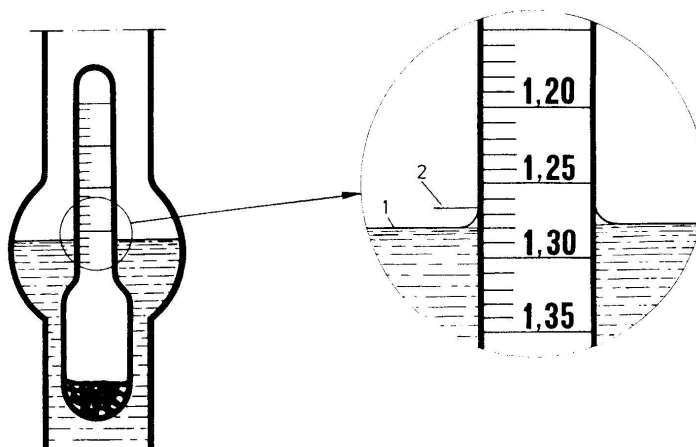
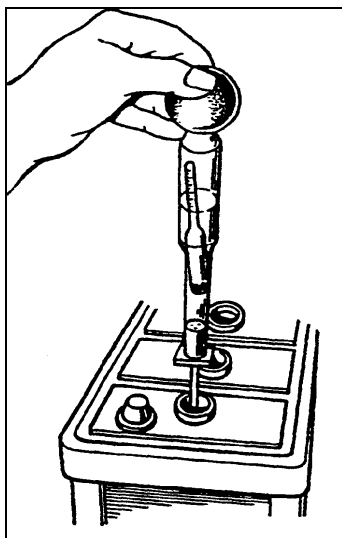
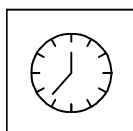


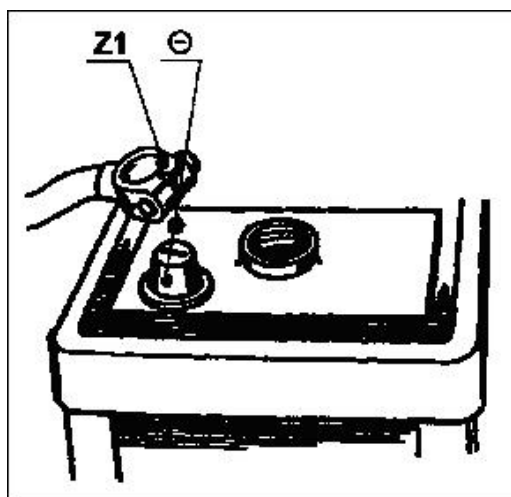
Fig. F-82. Electrolyte level & density measurement.
1- correct readout; 2- incorrect readout

The measurement of electrolyte density should be performed with help of an aerometer Fig. F-82. For measurement of the level use a glass tube. If the electrolyte level is too low replenish it with distilled water in each cell.



Check electrolyte condition & density and clean both battery clamps every 125 mth.

Electrolyte density (g/cm ³)	1,28	1,24	1,19	1,14	1,10
Charge level (%)	100	75	50	25	0



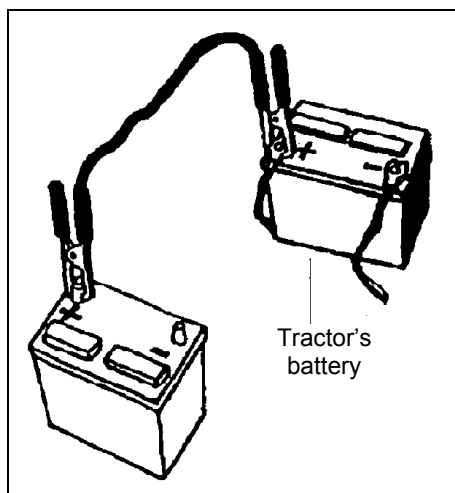
Keep battery clamps & poles (+), (-) clean, check periodically condition of connections. To keep the contact surface clean and dry cover conductor clamps and poles with technical vaseline. Check periodically if vent openings in filling plugs are not stopped.

Fig. F-83 Removing of clamps.
„Θ” - negative pole;
Z1- negative pole clamp.

CAUTION:

1. IT IS PROHIBITED TO HIT OR LEVER UP BATTERY CLAMPS TO REMOVE / INSTALL THEM – THIS MAY CAUSE BATTERY DAMAGE. FILLING PLUGS MUST BE ALWAYS SCREWED IN, EXCEPT DURING ELECTROLYTE LEVEL INSPECTION AND CHARGING FROM AN EXTERNAL SOURCE.
2. IF NECESSARY IS TO CONNECT AN EXTERNAL BATTERY (IF THE TRACTOR'S BATTERY IS DISCHARGED) CONNECT BOTH BATTERIES AS SHOWN BELOW.

1. Connect positive poles



2. The frame clamp (-) connect to an uninsulated tractor's element

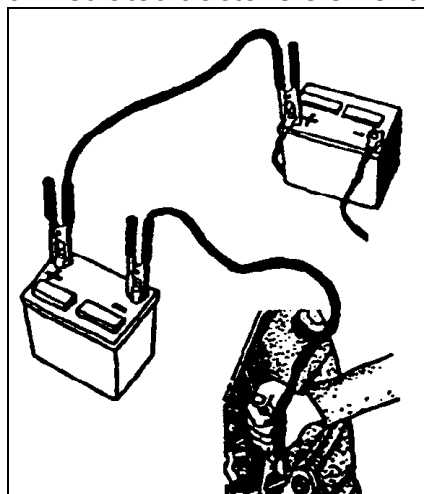
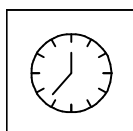
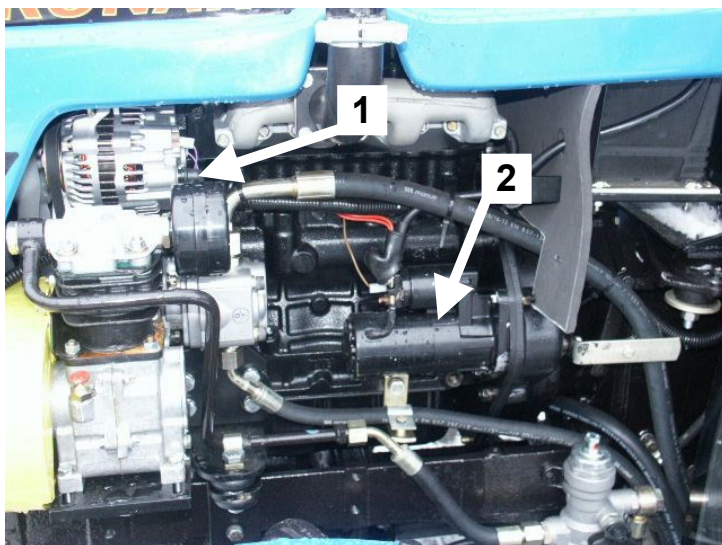


Fig. F-84 i F-85. Connection of an external battery.

ALTERNATOR AND STARTER

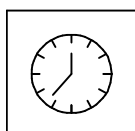


The alternator should be checked and inspected every 1000 mth or once a year.



The maintenance of the alternator amounts to removing of oil stains or impurities collected in the area of ventilation openings. The alternator bearings are factory lubricated and they do not require lubrication during operation. The current clamp should be tightened with the torque 3,9-5,1 Nm.

Fig. F-86 Alternator and starter.
1- alternator; 2- starter



Check the alternator belt tension (Fig. F-16) every 500 mth. Adjust the belt tension so that the pressure 100N (~10 kG) causes deflection ca. 13 in the halfway between the pulleys ok. 13 mm.

To adjust the belt tension loosen the alternator fastening screws, adjust the tension and retighten the screws.

New belts extend much more quicker, thus after 1-2 hrs check the belt tension again. If the battery is not fully charged (although the belt tension is correct), check the charging voltage (engine on). Correct charging voltage measured on battery clamps should amount to 13,9-14,5V.

GENERAL PRINCIPLES OF STARTER USE:

- switch on the starter only when the clutch is disengaged,
- do not switch on the starter when the crankshaft rotates,
- in the moment when the engine starts, switch off the starter (depress the key in the ignition switch).

LIGHTING AND FUSES

Adjustment of lights

The dim lights should be adjusted in a diagnostic station or in an ASS. For this purpose use screws situated under the dummy in cut-outs of the bonnet. (Fig. F-87). To get access to adjustment screws first remove the dummy by unscrewing fastening screws.

The adjustment screws can be screwed in or out to obtain correct adjustment of lights.

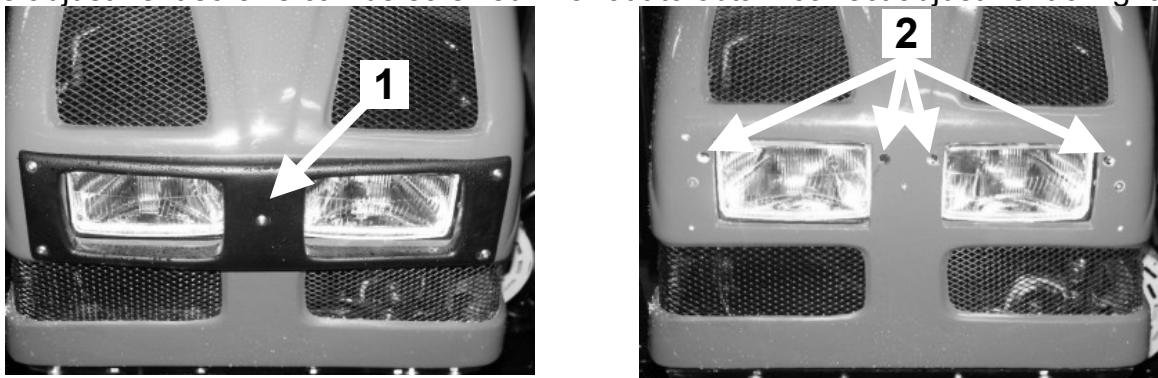


Fig. F-87 Placement of light adjustment screws. 1-dummy; 2- adjustment screws openings.

Adjustment of lights (self-made):

- adjust correct tyre pressure (according to the manual)
- leave the tractor on the level ground just in front a flat, white screen placed in the shadow on a vertical wall
- draw crosses on the screen; their centres should be distanced by the dimension C and placed in the height D (values of C and D should be measured on the tractor) (Fig.F-88)
- draw back the tractor by 10 m from the screen, switch on the passing lights and check if the line between lit and unlit screen parts goes 150 mm below the crosses
- adjust the lights with adjustment screws if necessary.

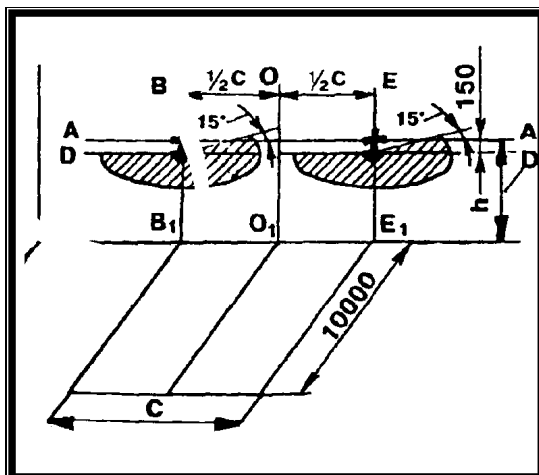


Fig. F-88. Lights adjustment scheme

A-A – centreline of lights;
 D-D – light boundary (150 mm below A-A)
 B-B₁, E-E₁ – vertical axes of left and right light;
 C- spacing of lights;
 D – height of lights.

To facilitate the readout of the light boundary during light adjustment cover the other light with a dark shield.

CAUTION:

Due to great importance of correct lights adjustment we recommend to perform the adjustment with help of special diagnostic equipment.

REPLACEMENT OF BULBS



CAUTION:

While replacing bulbs disconnect battery conductors, first – for safety reasons - the negative clamp.
 Do not touch halogen bulbs with bare fingers.

Sequence of operations by replacement of main reflector bulbs:

- remove the compact plug together with conductors off the bulb,
- remove the rubber shield;
- lever up the bulb fastening springs
- pull out the bulb from the socket,
- install the new bulb and make sure that the bulb holder matches with reflector socket.


CAUTION:

After each bulb replacement check and readjust (if necessary) the lights.

To replace bulbs in individual lamps remove lamp bowls and replace the bulb with a new one as follows:

- front reflectors 45/50W - 12V - 2 pcs
- front position lights 5W - 12V - 2pcs
- rear position lamps 5W - 12V - 2pcs
- front & rear blinkers 21W/12V - 2pcs
- STOP lights 21W/5W 12V - 2pcs
- lightning of the number plate 5W/12V - 2pcs
- indicator lamps on the instrument panel 1,2W/12V - 10pcs

REPLACEMENT OF FUSES



CAUTION:
ALWAYS INSTALL NEW FUSES, WHICH HAVE SUITABLE PARAMETERS. WHEN REPLACING THE FUSE FIRST FIND AND REMOVE THE CAUSE OF FUSE DAMAGE.

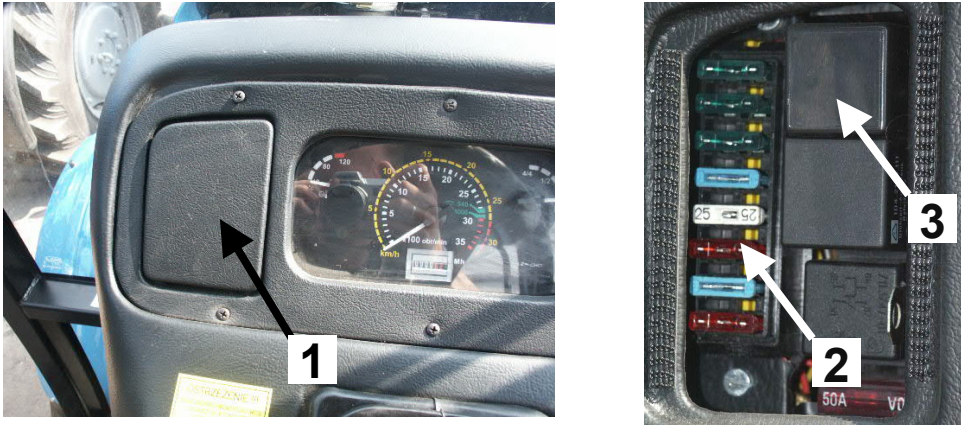
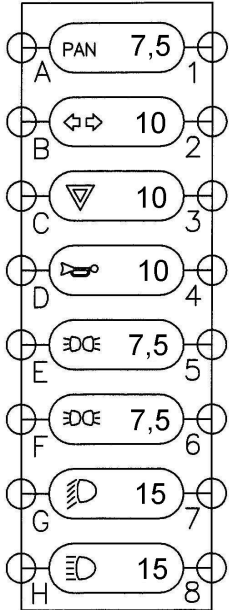


Fig. F-89 Placement of fuses in the console. 1- shield; 2- fuse box; 3- relays



Fuse No. on the drawing	Protected circuit	Value [A]
A 1	Indicator panel lighting	7,5
B 2	Blinkers (right and left)	10
C 3	Emergency lights	10
D 4	Horn	10
E 5	Position lights	7,5
F 6	Position lights	7,5
G 7	Dim lights	15
H 8	Road lights	15

Fig. F-90 Scheme and description of fuses at the console.



Fig. F-91 Arrangement of fuses on the upper cab panel.

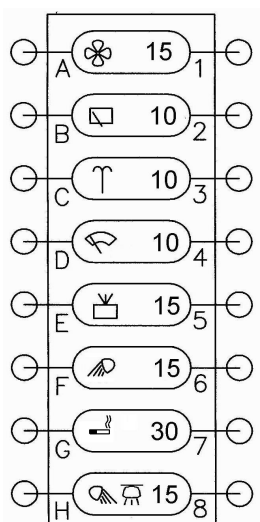
	Fuse No. on the drawing	Protected circuit	Value [A]
	A 1	Cab fan	15
	B 2	Rear window wiper and washer	10
	C 3	Windscreen washer + clock	10
	D 4	Windscreen wiper	10
	E 5	Radio	15
	F 6	Front operational lights	15
	G 7	Lighter	30
	H 8	Rear operational lights + cab lighting	15

Fig. F-92 Fuses on the upper cab panel 0 scheme and description.

Relays are situated close to fuses on the left side of the steering system console. Access to the relays is the same as to the fuses (Fig. F-89, POS. 3).

WIRING SYSTEM CONNECTION FOR TRAILERS

Tractors PRONAR-320AM are equipped with standard (according to Polish Standards) wiring system connection for trailers situated on the rear cab wall (outside).

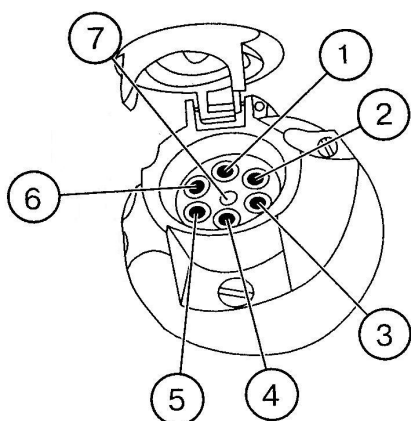


Fig. F-93 Wiring system connection for trailers (in quotes are given markings according to Polish Standards):

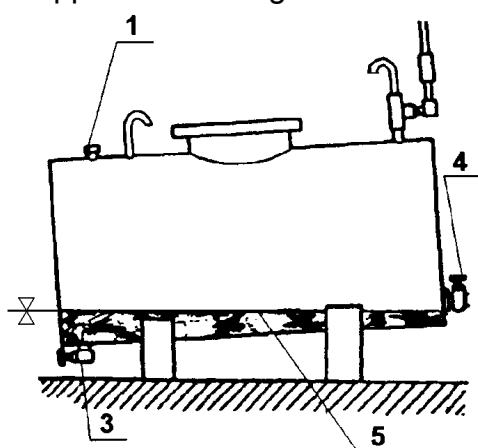
- 1 - (L) – blinkers – left;
- 2 - (+) – horn;
- 3 - (31) - „frame”;
- 4 - (R) – blinkers – right;
- 5 - (58R) – position lights – right;
- 6 - (54) – brake lights („stop”);
- 7 - (58L) – position lights - left;

21. FUEL REPLENISHMENT & STORAGE

Fuel purity is one of most important factors influencing lifetime, engine durability and efficiency of the fuel system. Inspection of fuel purity is one of basic user's duties.

Recommendations and principles of fuel storage:

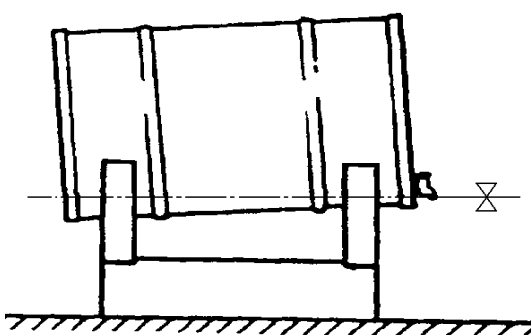
1. Do not store fuel in galvanic-coated tanks.
2. Do not clean inside of tanks and fuel system elements (hoses, funnels etc.) with fluffy clothes.
3. Do not store fuel in extremely large tanks.
4. Tank (barrel) for fuel storage should be situated in a roofed room and settled on supports to allow gravitational filling of tractor's tank.



5. The tank should be fitted with covered manhole for cleaning and the drain cock should be situated ca. 60 mm above the lowest tank point.
6. Periodically drain water and slime (through the drain valve).
7. Tank inclination angle – ca. 40 mm for 1m of tank length.

Fig. F-94 Fuel tank (recommended)

1- filling valve; 2- safety valve (decompression valve); 3- drain plug; 4- fuel plug; 5- minimum fuel level.



8. In the case when barrels are used valid are points 3,4,7.
9. Barrels, which out of necessity are stored outdoor should be positioned with plugs downward (to avoid water penetration).
10. Take the fuel from tanks / barrels only 24 hrs after filling, displacement, transport etc.
11. Filling plus should be fitted with sieve filters (removable) in both barrels and special tanks.

Fig. F-95 Barrel as a fuel storage.

22. TRACTOR STORAGE

If the tractor will not be used for longer time (>30 days) it should be suitably protected in his parking place and – after performing the operations given below – do not start the engine.

Preservation operations:

1. Close the fuel tap and disconnect the flexible conduit connected to the fuel pump.
2. Clean with a brush (soaked with kerosene or diesel) external surfaces of the injection pump.
3. Replace the fuel filter insert.
4. Remove fuel from the pump.
5. Loosen nuts of high pressure conduits on injectors and activate the starter for a few seconds (no longer than 3 s).
6. Fill the flexible suction conduit of the fuel pump with protective mixture (by immersing in into the mixture tank).
7. Manually fill the fuel filter and the injection pump with mentioned mixture; tighten the screws (observe proper sequence).
8. Set the fuel dosage to maximum.
9. Switch on the starter for ca. 8 seconds to distribute the preservation mixture.
10. Tighten the nuts of injectors conduits, connect the pump flexible conduit to the tap and open the tap.
11. Fill the fuel tank completely (from the storage tank).

CAUTION:

1. Above mentioned preservation procedure protects the injection system for maximum 90 days. After this period all preservation operations should be performed once again.
2. If the tractor will not be used for less than 30 days it is necessary to start the tractor weekly (7 days) for the time required for reaching the rated cooling system temperature.
3. Preservation mixture composition:
2dm³ (l) fuel + 150 ml cleaning engine oil
- the fuel should be taken from the storage tank and left for 48 hrs to settle (24 hrs if the tank looks like on the Fig. F-95), required quantity ca. 5dm³. When the fuel has settled drain off ca. 2dm³ to a separate vessel for mixture preparation.
4. After storage period the engine is ready to start-up but requires venting of the fuel system.

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NOTES
