SEMITRAILER POTATO HARVESTER ПКК-2-05

Operation Manual

КПК-5-0100000А РЭ

2025

Harvester general information

Manufactured by	OJSC “GZLiN”
Trademark	
Manufacturer’s legal address	16 Mogilevskaya str., 246010, Gomel Republic of Belarus
Contact phone numbers	tel.(0232) 59 61 31 fax(0232) 59 42 03
Semitrailer Potato Harvester ПКК-2-05	ПКП-2-05 _____ complete set code
Month and year of manufacture	
Serial number	
National number	

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IMPORTANT NOTICE FOR DIRECTORS OF OPERATING ORGANIZATIONS AND FARM MACHINE OPERATORS!

This operation manual is intended primarily to operators (harvester drivers) who operate and maintain the semitrailer potato harvester ПКК-2-05. It contains information about setting, operation, technical maintenance and transportation.

Only persons who have a tractor driver / machine operator certificate with respective open permission category and trained (re-trained) by official dealers are allowed to operate the harvester and perform setting, tunning and technical maintenance.

The operation manual contains important information required for safe operation of the harvester, its operation requirements and recommendations, necessary adjustment and technical maintenance procedure, and must be kept in an accessible place in the tractor cab during the harvester operation.

Before putting the harvester into operation, please read carefully this operation manual against signature in the data sheet and follow its instructions and requirements.

Further assembly, technical maintenance and repairs of the harvester shall be done at specialized workshops by properly trained staff.

The manufacturer is not responsible for any malfunctions due to the use other than as intended, as well as use upon expiration of the specified life of the harvester!

Intended use also includes compliance with the operating, care and maintenance conditions specified by the manufacturer.

The operator and the operating organization director shall comply with accident prevention rules, as well as other generally accepted occupational health, safety and road traffic rules. Any use going beyond these limits is considered “unintended use”.

Unintended use is:

- setting and technical maintenance contrary to the operation manual;
- troubleshooting and repair operations while the drives and/or motor are running;
- failure to observe precautions specified on the harvester and in the operation manual;
- restoration to serviceability and repairs by the staff not properly trained;
- independent modification of the harvester design;
- use of non-original spare parts;
- people transportation;
- cargo transportation;
- harvester use upon expiration of the specified life.

⚠ **CAUTION:** Do not use parts, accessories, additional attachments and instruments that are not originally produced by the manufacturer as spare or replacement parts as it may adversely affect the harvester functional properties, as well as operational and traffic safety. Any such use will preclude the manufacturer's liability!

The manufacturer is constantly working to improve the design of the harvester; therefore, there may be changes in the design of individual assembly units and parts that are not reflected in this operation manual. Some technical data and figures may differ from the harvester's actual ones; dimensions and weight are for information only.

The operation manual meets the technical documentation valid as of March 2025. The manufacturer is not responsible for changes to the design of the sold harvesters, and excludes liability for damage resulting from unauthorized changes.

Abbreviations and symbols used:

OM – operation manual;
Harvester – Semitrailer Potato Harvester ПКК-2-05
AS – adapter set;
PTO – power take-off shaft;
MTM – monthly technical maintenance;
TM – technical maintenance;
TM-1 – technical maintenance No.1.

In this operation manual, paragraphs related to the safety of service staff are marked by special symbols:



ATTENTION!
CAUTION!
PROHIBITED.
Indicates instructions which, if not observed, may result in danger to life and health of people or damage to the machine.

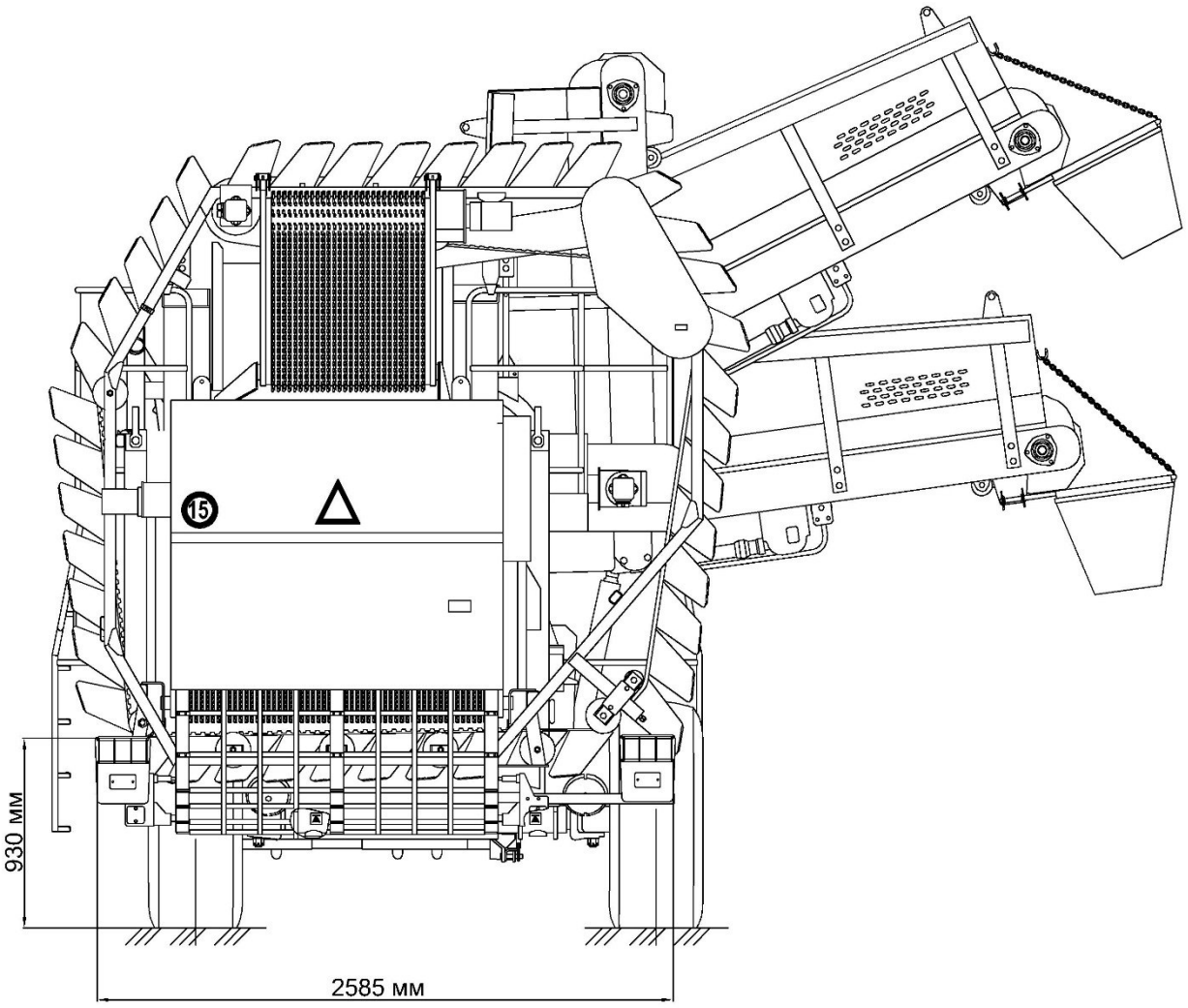
Meets the requirements of the Technical Regulation of the Customs Union *On Safety of Machines and Equipment* (TR CU 010/2011)

 **ATTENTION:** Timely completion of the sections of the operation manual is mandatory for examination of claims to the manufacturing plant!

I have read and understood the operation manual

_____

signature (full name)



Location of signaling lights on the harvester

Safety requirements

General provisions

Read carefully this OM before the harvester operation and strictly follow its recommendations and instructions.

In addition to OM instructions, follow the occupational health and safety instructions.

Only persons who have studied the harvester's design, undergone special training, and have been instructed in occupational health and safety are allowed to work.

Before starting work, sorting workers are required to undergo appropriate training and instruction in occupational health and safety.

⚠ **ATTENTION:** Strictly observe the warning and prohibition signs on the harvester!

Safety rules for transportation and depreservation.

Use crane with load capacity not less than 7 tons for loading and unloading. Slinging and jacking up must be done in the places marked on the harvester.

Keep unauthorized persons away from the loading and unloading area.

When transporting the harvester with a tractor, the harvester must be transferred to the transport position: the hopper folded and secured with a safety chain, the digging section of the digging separating block transferred to the transport position and secured on the frame of the harvester, the tractor’s PTO shaft disengaged. When folding the harvester hopper, the hopper loading conveyor must be in the lowest position.

⚠ **DO NOT ALLOW** people to be on the platforms for sorting workers during the harvester transportation.

The harvester’s light signaling equipment must be connected to the tractor.

⚠ **ATTENTION:** When transporting the harvester on the public roads, follow the Road Traffic Regulations of the operating country. Do not exceed the established transport speed limit of 15 km/h. When driving on uneven roads, reduce the transport speed to 5 km/h!

Observe the following requirements during depreservation:

- the space used for depreservation shall be equipped with supply and exhaust ventilation and have the necessary firefighting equipment available;

⚠ **IT IS PROHIBITED** to smoke, store and have food at the space used for depreservation.

- depreservation sites shall be separated from other production processes to avoid exposure of persons not working with preservation equipment (insulation, air curtains, etc.) to harmful factors. The maximum allowable concentrations of harmful substances in the workplace air, as well as air temperature, humidity and movement in the areas shall not exceed the standards established by the Ministry of Health.

Persons working at preservation and depreservation sites shall use personal protection equipment (protective aprons, gloves and goggles).

During depreservation, follow the requirements specified in Section 5 of the operation manual.

Testing and running-in safety requirements

When testing, do not start the tractor's motor in poorly ventilated closed space to avoid carbon monoxide poisoning.

All open gears of the harvester must be covered with protective covers and guards.

⚠ **DO NOT** use propeller shafts without protective covers or with damaged ones.

Propeller shafts must be connected and secured only when the tractor PTO shaft is disengaged, the engine is switched off and the ignition key is removed.

Each time before the PTO drive activation, visually examine the propeller shafts and activate the drive only after making sure that they are securely fastened.

⚠ Before PTO shaft activation, put down the digging section to working position.

⚠ Unauthorized persons must be kept away from the site during running-in operation.

⚠ During the harvester testing and running-in, the operator must be in the tractor cab.

The harvester must be connected to and disconnected from the tractor on a level horizontal ground.

⚠ Never activate the PTO shaft with the engine off.

Operation safety requirements

When operating and maintaining the harvester, observe the Safety Regulations for Work on Tractors, Agricultural and Specialized Machines

⚠ **ATTENTION:** When preparing the harvester for operation, remove the transport link installed for securing the hopper and the frame of the harvester during shipment to the customer!

It is prohibited to operate the harvester with the transport link not removed.

⚠ **DO NOT** drive in reverse without raising the digging section of the digging separating block to transport position.

⚠ **DO NOT** operate the harvester on unprepared fields clogged with metal objects and stones.

Examine the field carefully before work, especially close to roads, settlements and overhead power transmission lines.

It is not allowed to operate the harvester in the protective zone of overhead power transmission lines.

Each time before the tractor's PTO drive activation, visually examine the propeller shafts and activate the drive only after making sure that they are securely fastened.

Before the PTO shaft activation and driving start, make sure that the way is free. Give a warning with a horn.

⚠ **DO NOT** turn the harvester when the tractor's PTO shaft is engaged.

⚠ **DO NOT** carry out potato harvesting, repair and maintenance work when the hopper is raised.

The harvester is matched with 1.4 traction class wheeled tractors MTZ-80 and MTZ-82, which must be equipped with hydraulic hook (tow hitch ТСУ-2 supplied with the harvester).

⚠ To avoid accidents, transfer the hopper from up to down position with the tractor hydraulic distribution valve handle in **FLOATING** position only.

⚠ **DO NOT** allow people to stand under the hopper of the working harvester.

⚠ **IT IS PROHIBITED** to climb on and off the platforms for sorting workers while the harvester is moving.

⚠ **DO NOT ALLOW** people to be on the platforms for sorting workers during the harvester transportation.

⚠ Traveling and maneuvers with full hopper are not allowed!

⚠ **ATTENTION:** In sections of fields and roads over which overhead power lines pass, the harvester traveling and work is only allowed when the aerial distance from the harvester to the nearest live wire is not less than the value specified in the table!

Overhead line voltage, kV	Minimum distance, m
up to 35	2.0
from 35 to 110	3.0
from 110 to 220	4.0
from 220 to 400	5.0
from 400 to 750	9.0
from 750 to 1150	10.0

WARNING:

⚠ The harvester ПКК-2-05 is matched with 1.4 traction class wheeled tractors MTZ-80 and MTZ-82, which must be equipped with hydraulic hook (tow hitch ТСУ-2) supplied with the harvester.

This is due to safety reasons, as the load on the harvester's towing ring with empty hopper is 1,060 kg.

⚠ In order to avoid accidents, do not match the harvester with the tractor equipped with a drawbar brace (tow hitch ТСУ-1-Ж and ТСУ-1), as permissible vertical load on the drawbar brace is 650 kg for MTZ-80 and MTZ-82 tractors.

⚠ In order to avoid accidents, do not engage the tractor's PTO shaft with the digging section raised to transport position.

⚠ When transporting the harvester with a tractor, the harvester must be moved to the transport position: the hopper folded and secured with a safety chain, the digging section of the digging separating block moved to the transport position and secured on the frame of the harvester with safety ropes, and the tractor's PTO shaft disengaged. When folding the harvester hopper, the hopper loading conveyor must be in the lowest position.

⚠ It is not allowed to transport harvested potatoes in the harvester's hopper!

⚠ The light signaling equipment of the harvester must be connected to the tractor.

Give a warning with a horn before the PTO shaft engagement and (or) before moving off.

⚠ When detaching the harvester from the tractor, stop the harvester with a hand brake, block the running swivel wheels with wheel blocks and put down the parking leg.

⚠ In order to avoid damaging potato tubers, the height of potato unloading to the truck shall not exceed 35 cm (when falling onto a hard surface).

⚠ It is not recommended to harvest potatoes at soil temperature lower than plus 8 ºC, since this can easily damage the tubers and make them difficult to store, and there is also a risk of unheated oil being discharged through the breather in the oil tank when the harvester is first started up.

⚠ When potato harvesting takes place in dry weather with a plenty of dust, the sorting workers working on the harvester must wear respiratory and eye protection equipment.

⚠ Both platforms for sorting workers have panels with pushbuttons for emergency stop (stopping the working parts of the harvester with a hydraulic drive), moving the hopper bottom conveyor and voice communication with the operator.

In addition, there are separate emergency stop buttons (per each sorting worker) on the opposite side of both platforms.

The process can be restarted from the control panel in the tractor cab only.

The tractor's audible signal and the audible signal installed on the left platform for sorting workers are used for feedback, and sorting workers must be instructed on this before starting work.

⚠ In order to protect the harvester electric wiring from damage by rodents (mice, rats, etc.), it is recommended to equip the harvester storage facility with ultrasonic rodent repellent emitters as instructed by the emitter manufacturing plant.

⚠ The harvester conveyor connecting elements (locks and connectors) are subject to natural wear and tear and loosening of screw connections during operation, so check their technical condition daily. In order to avoid the conveyor braking, replace the connecting elements worn to more than 60% independently, without calling the service center specialists. Check screw connection for strength after the first loading, and than after each 50 hours of work. Nuts must be locked to prevent self-unscrewing.

Breakage of the conveyor connecting elements is not considered fault.

⚠ If the harvester is not used for more than three days and is stored in an open area, clean the chain links of the hopper conveyor 43 (Figure 1.13) of dirt and wash them with a cleaning fluid (kerosene, diesel fuel, or gasoline) to prevent rusting. After drying, lubricate the chain by brush (swab) with tractor or diesel oil heated to 80 - 90 ºС. The conveyor with a lubricated chain must be rotated at least 10 times.

⚠ During operation, the support rollers move along the tops of the ridges and, due to the perceived weight of the digging section, compact them on medium cohesive soils or prematurely destroy them on light soils, which can cause undesirable consequences. To reduce the roller pressure on the ridge, pneumatic hydraulic accumulator with pressure gage is used in the harvester's hydraulic system.

⚠ **DO NOT** match the harvester with the tractor equipped with tow hitch ТСУ-1Ж.

⚠ **DO NOT** ALLOW PEOPLE TO STAND UNDER THE HOPPER OF THE WORKING HARVESTER.

⚠ **IT IS PROHIBITED** to climb on and off the platforms for sorting workers while the harvester is moving.

During the harvester operation, the sorting workers must be attentive and strictly follow safety rules to avoid injuries. As soon as the workers have climbed the platforms, protective devices must be locked.

⚠ **DO NOT ALLOW** people to be on the platforms for sorting workers during the harvester transportation

All operations related to repairs, adjustments and maintenance of the harvester must be done only with the tractor engine off, the operative parts fully stopped, the ignition key removed, the hopper down, the hopper folding part locked and the digging section locked.

⚠ **IT IS PROHIBITED** to use the hopper with any malfunctions.

⚠ **DO NOT** drive in reverse without raising the digging section of the digging separating block to transport position.

When detaching the harvester from the tractor, stop the harvester with a hand brake, block the running swivel wheels with wheel blocks and put down the parking leg.

ATTENTION: The hydraulic system is under high pressure!

When connecting tractor hydraulic hoses to and disconnecting from the harvester hydraulic system, make sure that the tractor and the harvester hydraulic systems are not under pressure (the hopper down, the hopper folding part and the digging section locked).

Make connections as marked on the hoses.

Incorrect connection will lead to improper functioning and risk of accident.

When disconnecting the tractor's hydraulic system from the harvester's hydraulic system on the tractor, the hydraulic hoses must be placed in pairs on the harvester in the grooves of the holder on the propeller shaft laying stop.

Avoid oil leaks and drops in oil duct connections. Spilled oil must be wiped up immediately. Use auxiliary aids to do this.

Check hydraulic hoses regularly and replace the damaged and worn ones by new ones. The replacement hydraulic hoses shall meet respective technical requirements of the harvester hydraulic system.

When repairing hydraulic equipment, the harvester hydraulic system must be depressurized (the hopper down, the hopper folding part and the digging section locked).

When working with hydraulic oil, observe personal hygiene rules. In case of contact of oil with the mucous membrane of the eyes, it should be washed abundantly with warm water. In case of skin contact, oil should be removed with warm soapy water.

Be careful when draining hot oil - there is a risk of burns.

Clean the clogged operating parts of the harvester only with a scraper installed on the harvester, with the tractor engine off and PTO shaft disengaged.

The noise level at the tractor driver workplace is 81 dB.

In the event of long-term work with the harvester, use ear personal protective equipment (PPE).

ATTENTION: When personal protective equipment (PPE) is used, the working time is unlimited!

Safety requirements for maintenance and troubleshooting

Repairs and technical maintenance operations must be done by trained service specialists only.

Repair operations not detailed in this operation manual may be done only be specially trained staff.

Strictly follow safety rules when using lifting and handling equipment.

Tools and devices for maintenance must be in good working order and ensure safe work performance.

Do not leave tools or other objects on the harvester after repairs or adjustments. They may be caught by operating parts and cause accident.

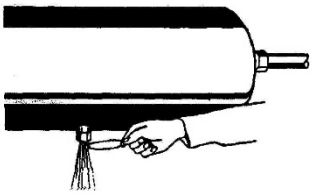
Before welding or other open fire operations, clean the harvester and area around it carefully from plant residues.

The harvester repairs, technical maintenance and lubrication must be done only with the engine switched off.

⚠ Before making any repairs of hydraulic equipment, release pressure from the hydraulic system.

Discharge condensate from the receiver and, if necessary, bleed air from the lines and the receiver using the condensate drain valve located at the bottom of the receiver.

To perform this operation, pull aside the ring mounted on the condensate drain valve stem.



⚠ **DO NOT** perform any repair operations with the hopper raised.

Safety requirements for placement into storage

When preparing the harvester for storage, follow the requirements specified in Section 5 of the operation manual.

The staff engaged in cleaning and applying corrosion resistant lubricants must be provided with aprons, gloves and goggles.

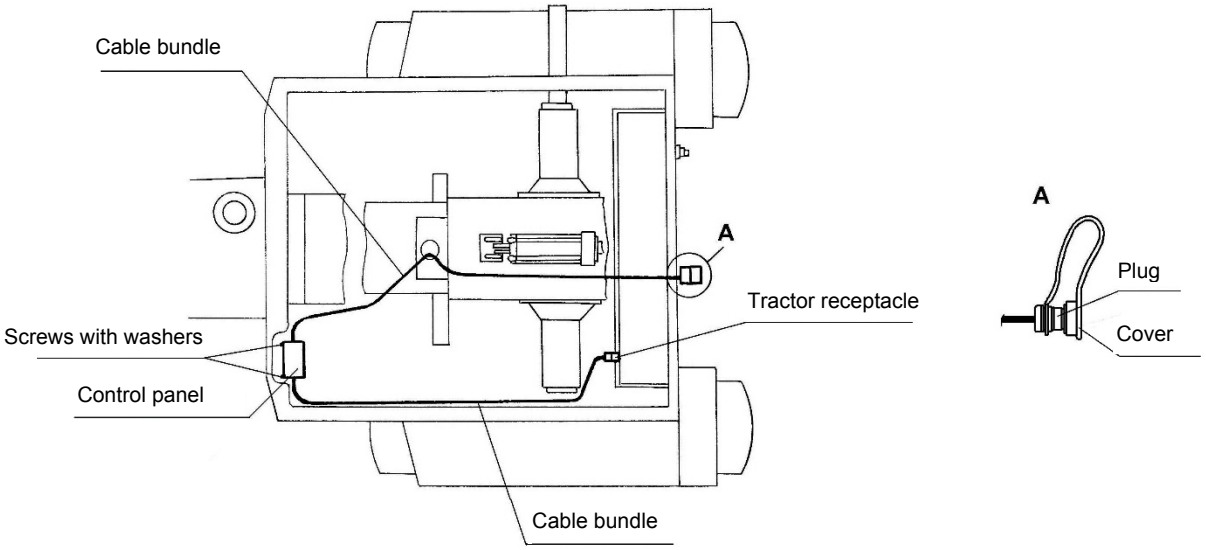
During storage, measures must be taken to prevent the harvester from moving unintentionally.

Fire safety rules

The tractor matched with the harvester must be fitted with firefighting equipment (shovel and fire extinguisher).

The tractor driver trained in Basics of Fire Safety is responsible for fire safety measures for work with the harvester.

When performing welding operations with the harvester connected to the tractor, disengage the PTO shaft, stop the engine, disconnect the tractor MASS and the control panel harness plug. Hydraulically operated rams and high-pressure hoses must be protected from ingress of welding spatter.



Keep the harvester clean; clean the areas of oil release via gearbox breathers, oil tank areas and connections of propeller shafts with gearboxes once per shift.

The space used for welding and open fire operations must be fitted with firefighting equipment.

⚠ **IT IS PROHIBITED** to make fires, perform welding operations and use all kinds of open fire in the harvested areas.

Avoid oil leaks in oil duct connections.

Hydraulic oil is a flammable liquid. The following extinguishing media are applicable in case of oil ignition: sprayed water, foam; for smothering – carbon dioxide, СЖ6 compound, “3.5” compound and steam.

In case of fire, cover the flames with sand or cover with sacking, tarpaulin or other dense fabric, use the tractor fire extinguisher, and call fire brigade.

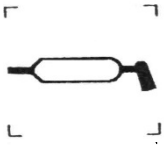
⚠ **DO NOT** pour water on burning fuel.

Safety signs

During work, strictly follow the warning and direction signs on the harvester, as they contain important instructions for safe operation and accident prevention.

Strictly observe the warning and prohibition signs on the harvester.

The warning and direction signs on the harvester must always be kept clean. Replace them, if damaged. In the event the parts with signs are replaced, make sure that the new ones have respective signs.



- Greasing area



- Safety symbol
(The sections of this operation manual marked with this sign contain special instructions for safe and trouble-free operation)



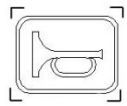
- Lifting point



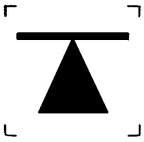
- Operation manual for harvester operator (read and follow this OM)



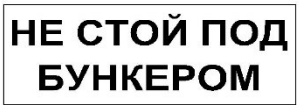
- Lubrication area

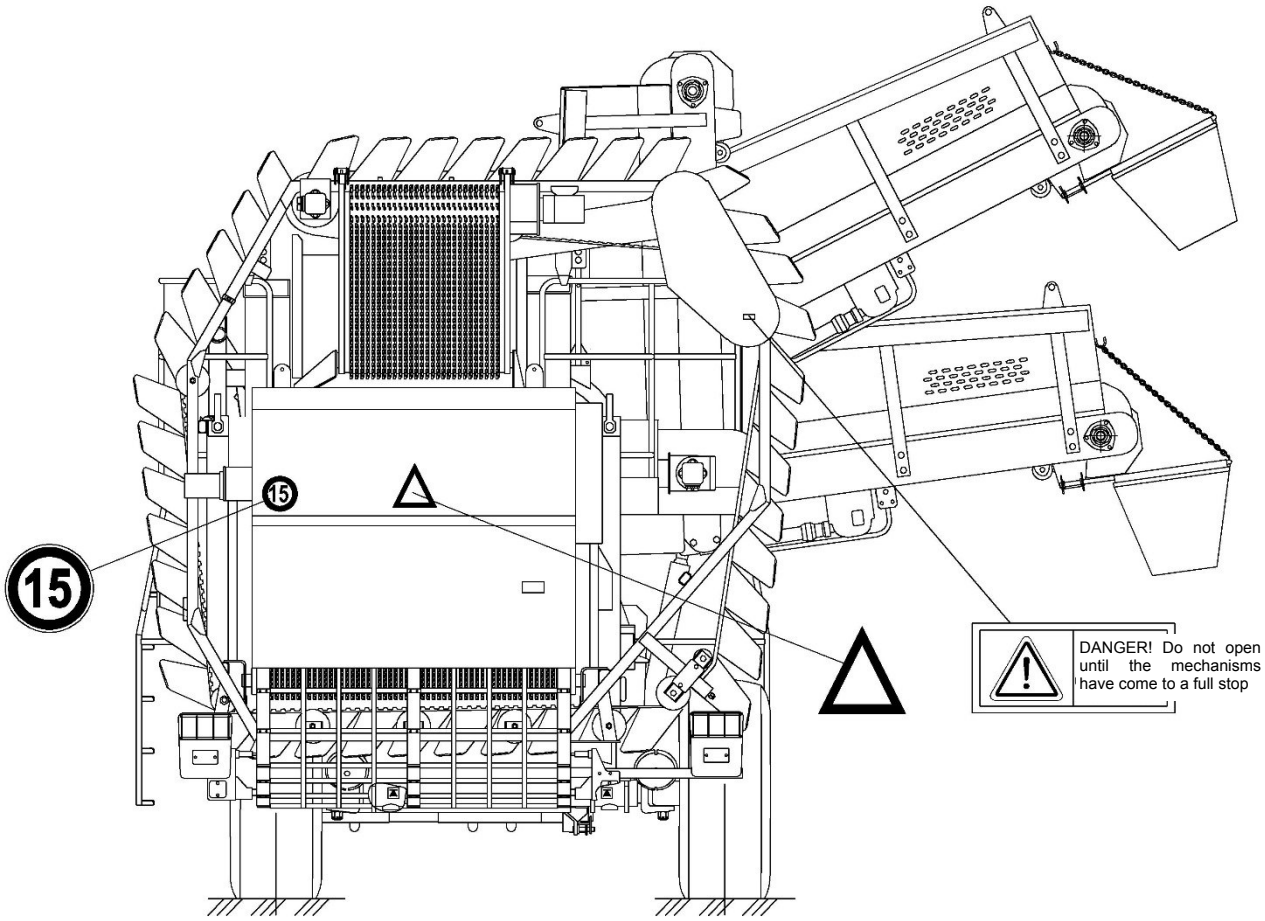


- Signal button for communication between the sorting worker and the tractor driver

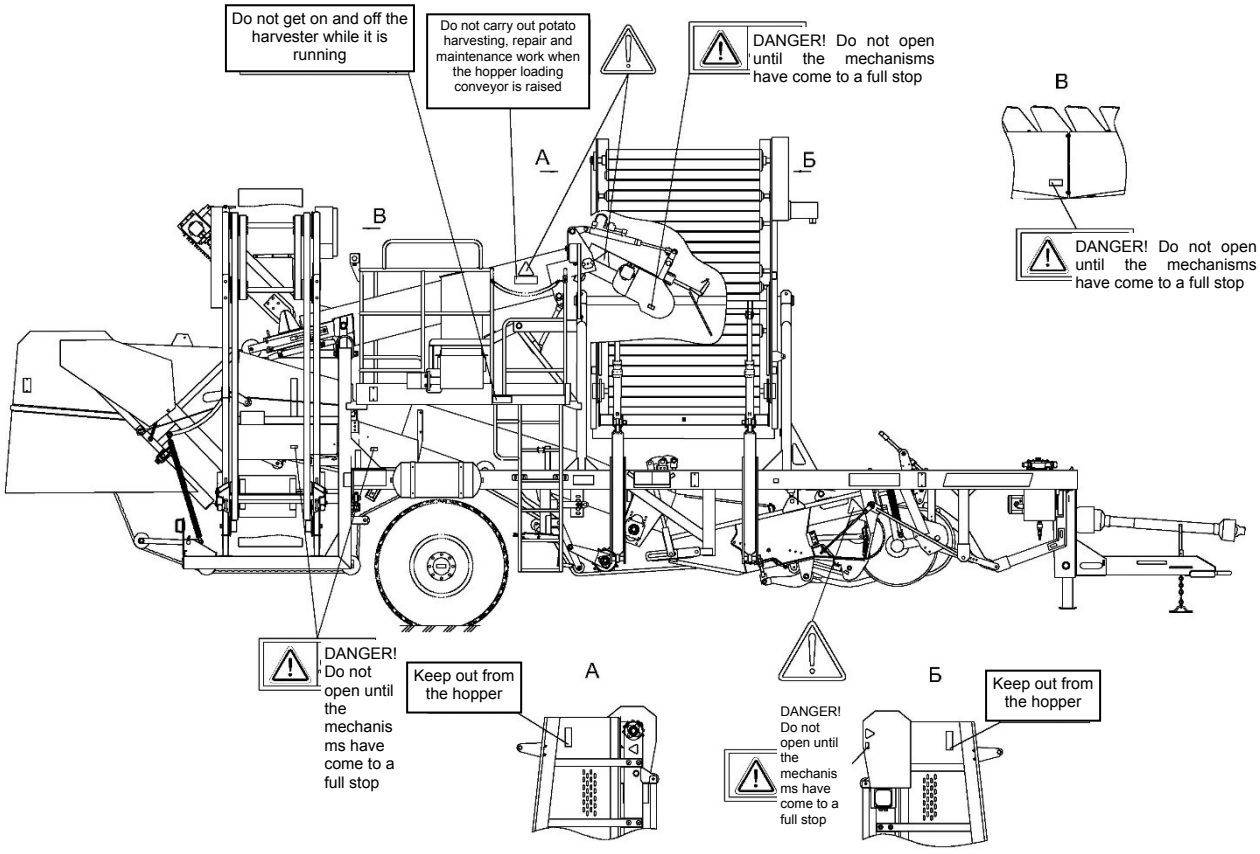


- Lifting jack position

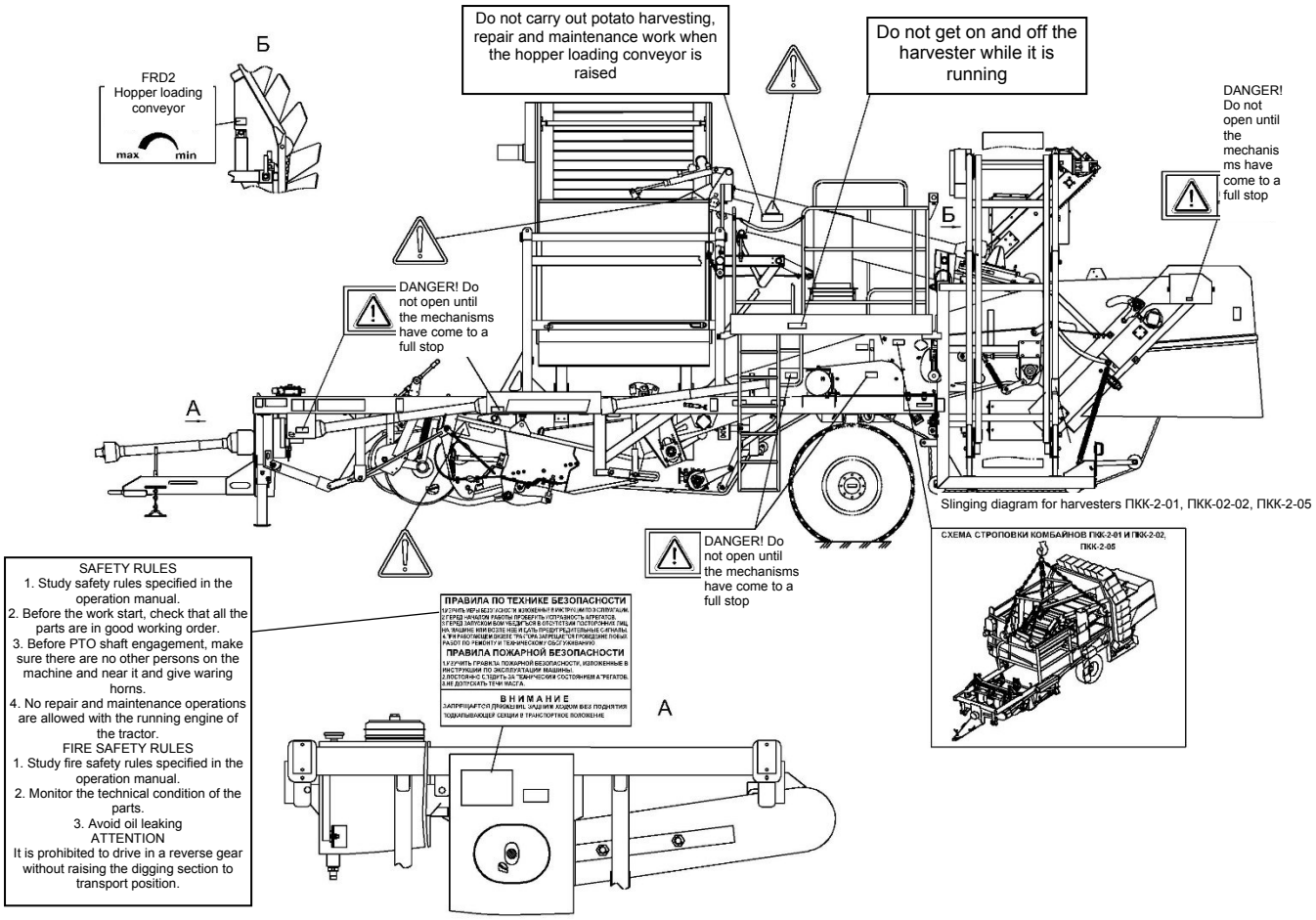
Safety signs on the unit	Meaning
	Attention!
	Danger! Do not open until the mechanisms have come to a full stop
	Do not carry out potato harvesting, repair and maintenance work when the hopper loading conveyor is raised
	Do not get on and off the harvester while it is running
	Keep out from the hopper
	SAFETY RULES 1. Study safety rules specified in the operation manual. 2. Before the work start, check that all the parts are in good working order. 3. Before PTO shaft engagement, make sure there are no other persons on the machine and near it and give waring horns. 4. No repair and maintenance operations are allowed with the running engine of the tractor. FIRE SAFETY RULES 1. Study fire safety rules specified in the operation manual. 2. Monitor the technical condition of the parts. 3. Avoid oil leaking ATTENTION It is prohibited to drive in a reverse gear without raising the digging section to transport position.
	Speed limit: 15 km/h



Safety signs on the potato harvester (rear view)



Safety signs on the potato harvester (right-side view)



Safety signs on the potato harvester (left-side view)

Keep out from the hopper

1 Description and work

1.1 General information

The combine is designed for harvesting potatoes on light and medium soils in potato cultivation zones with temperate climate, except for mountainous areas, with a maximum field slope of not more than 4º (Figure 1.1).

Any other use is not allowed and is considered unintended use.

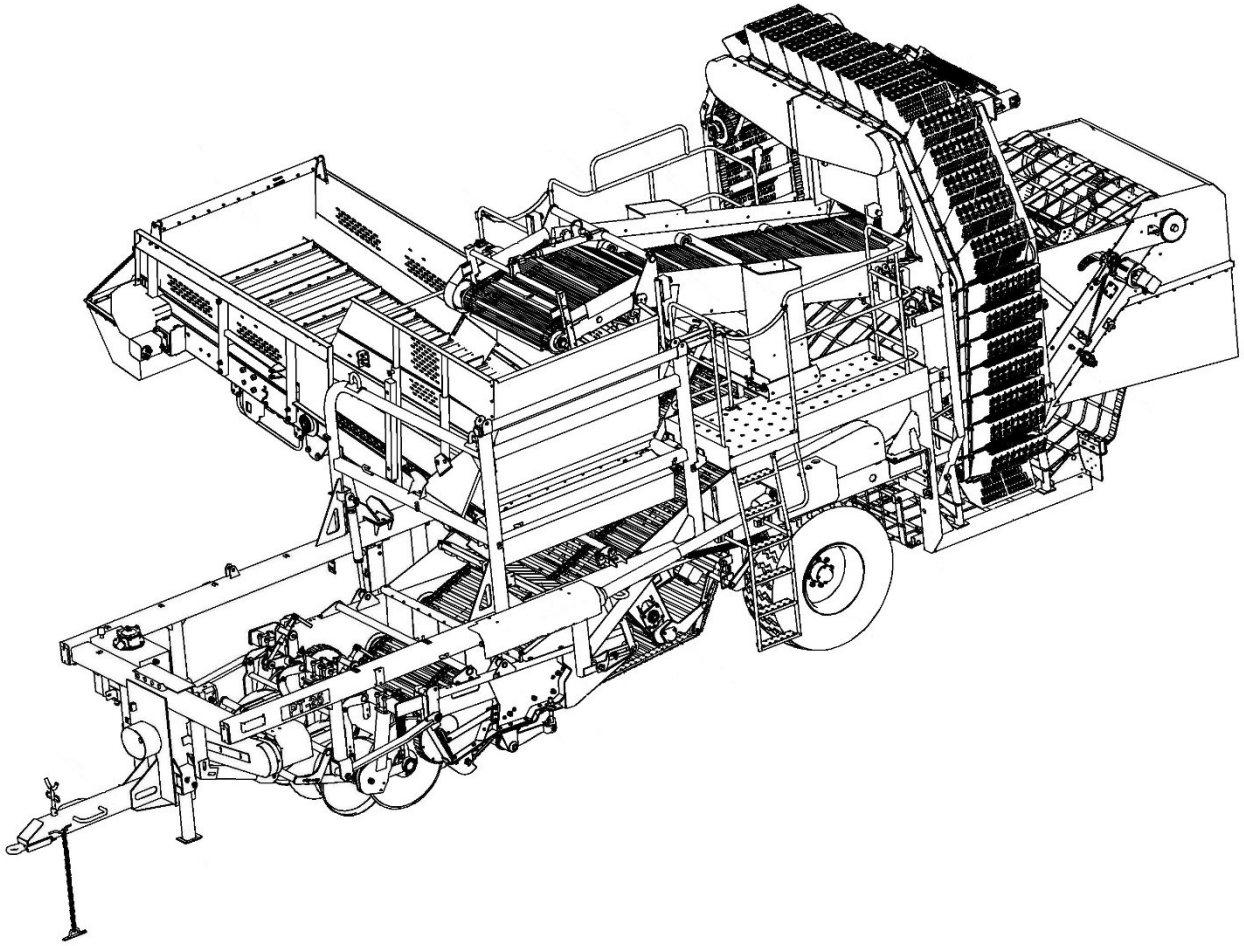


Figure 1 – Semitrailer Potato Harvester ПКК-2-05
(with hopper and sorting table)

Before putting the harvester into operation, read carefully this operation manual and strictly follow its recommendations and instructions.

Long-term and secure work of the machine is subject to proper operation and timely maintenance.

Harvester scope of application as per Table 1.1.

Table 1.1

Harvester modification code	Name and completeness of harvester	Scope of application
ПКК-2-05*	Harvester with hopper and sorting table	Potato harvesting on ridged plantings with row spacing from 70 to 75 and 90 cm on soils with the content of stones not more than 150 mm in size in the sifted soil not more than 15% of the potato weight**

*** The conventional name is applied to the harvester in accordance with design documentation.**

****When used with КАН adapter set manufactured under TR BY 100230575.241 and supplied optionally for an additional fee, the harvester can be used for onion harvesting.**

On customer's request, a set of the first separating conveyor belt with 44 mm pitch (with connector and drive shaft) with elastic coating through one stick can be delivered to the combine for an additional fee.

1.2 Technical specifications

The main parameters and technical data of the harvester are given in Table 1.2

Table 1.2 - Technical data

Parameter	Value
Type	Semitrailer
Performance per 1 h, running time, hectares/h:	
- with 70 cm row spacing	0.28 – 0.84
- with 75 cm row spacing	0.3 – 0.9
- with 90 cm row spacing	0.36 – 1.0
Number of simultaneously harvested rows, pcs	2
Digging depth against the ridge top, m	0.25
Loading height of an unloaded vehicle with main or overhead walls, mm	2800
Tuber falling height, cm	35
Operating speed, km/h	2 – 6
Transport speed, km/h	15
Harvester overall dimensions in operating position, mm:	
- length	10000
- width	5200
- height	4000
Harvester overall dimensions in transport position, mm:	
- length	10000
- width	4000
- height	4000
Road clearance, mm	200
Minimum inside turning radius (by outer wheel track), m	9
Rear wheel gage, mm	2100±90
Tire marking	16.5/70-18
Tire pressure, kPa	0.37±0.01
Harvester tare (dry) weight, kg	6800^{+200}

Table 1.2 ending

Parameter	Value
Storage hopper: - type - hopper capacity, kg	 with bottom unloading conveyor 2000 - 2500
Hydraulic system working pressure, MPa	16^{+1}
Electric equipment system rated voltage, V	12
Service staff, persons including: tractor driver sorting worker	 1 - 5 1 0 - 4
Specific fuel consumption, kg/hectare	28
Service life	8* years
Storage life (without represervation)	1* year
Drive of operating parts and hydraulic system of the harvester	From the tractor power take-off shaft with rotation speed of 9 s^{-1}
Note – Performance should be defined and monitored with the following agricultural background requirements: - limit field slope - soil moisture (for ПКК-2-05 harvester), % - soil strength, MPa - yield, t/hectare - field weediness, t/hectare	 4º 24 1.4 10 - 60 1.5

With agricultural backgrounds different from those specified in the note, the quality parameters, performance and fuel consumption will differ from the values specified in Table 1.2.

* Upon expiration of the specified parameters (service life, storage life), the harvester is withdrawn from operation and decision is made whether to send it for repairs, dispose of it, or specify new parameters (service life, storage life).

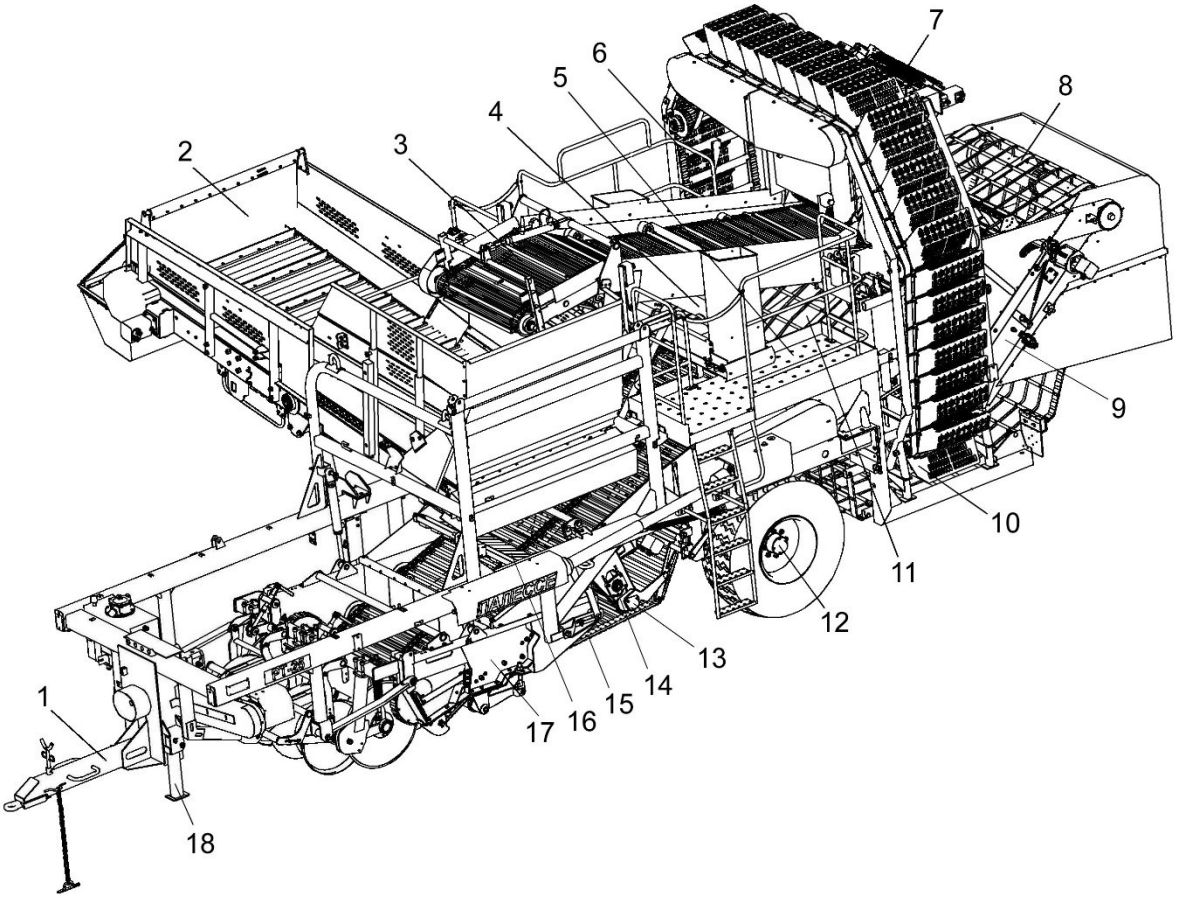
1.3 Arrangement and operation

1.3.1 Harvester design

ПКК-2-05 harvester (with hopper and sorting table) is matched with 1.4 traction class wheeled tractors.

The harvester operating parts are driven by the tractor PTO shaft via the propeller shaft and hydraulic motors installed on the harvester.

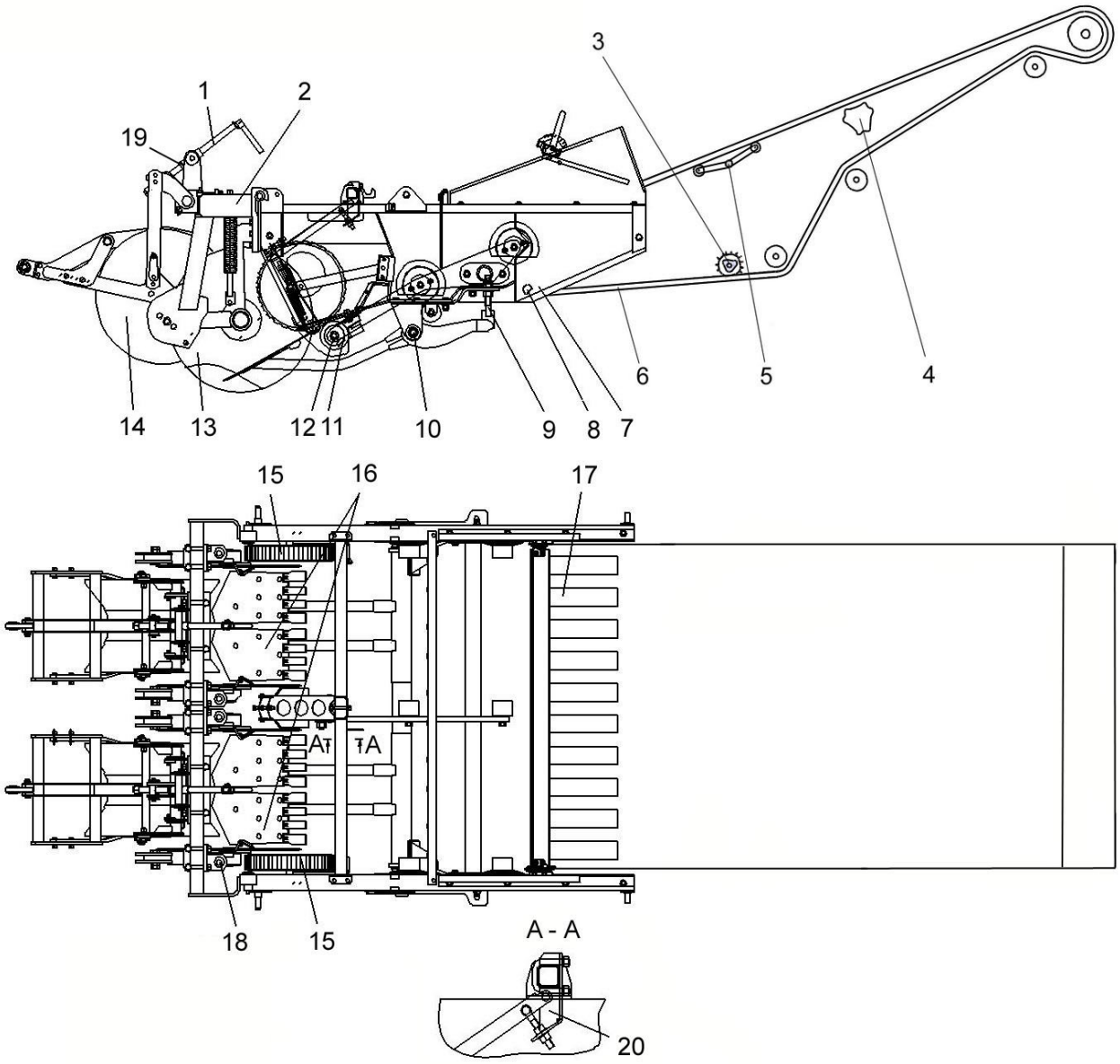
The harvester components: frame 1 (Figure 1.2) with rigid tow bar and towing ring, parking leg 18, steering wheel axle 12, digging separating block with rolls and discs 17, first sifting conveyor 15, layer leveler 16, active vibrator 14, tensioning device with cleaning roll 13, second sifting conveyor 11, bottom inclined slide 9, vine removal conveyor 8, lifting conveyor 10, accompanying conveyor 6, top inclined slide 7, platforms for sorting workers 5, hopper loading conveyor 3, impurity conveyor with trays 4, hopper 2.



1 - frame with rigid tow bar; 2 - hopper; 3 - hopper loading conveyor; 4 - impurity conveyor with trays; 5 - platforms for sorting workers; 6 - accompanying conveyor; 7 - top inclined slide; 8 - vine removal conveyor; 9 - bottom inclined slide; 10 - lifting conveyor; 11 - second sifting conveyor; 12 - steering wheel axle; 13 - tensioning device with cleaning roll; 14 - active vibrator; 15 - first sifting conveyor; 16 - layer leveler; 17 - digging separating block with rolls and discs; 18 - parking leg

Figure 1.2 – Semitrailer Potato Harvester ПКК-2-05
(with hopper and sorting table)

1.3.2 The digging separating block components (Figure 1.3): beam with supporting rolls and cutting discs 2, side walls 7 and 8, and two vine pulling wheels 15, plowshare 16, layer leveler 17.



1, 18 – adjusting screws; 2 – beam with rolls and discs; 3 – cleaning roll; 4 – passive shaker; 5 – active vibrator; 6 – first separating conveyor; 7, 8 – side walls; 9 – regulator; 10 – plowshare axle; 11, 12 – rollers; 13 - cutting discs; 14 – rolls; 15 – vine pulling wheels; 16 – plowshare; 17 – leveler; 19 – adjusting bushing; 20 –– valve

Figure 1.3 – Digging separating block and first separating conveyor

The depth of soil layer cutting by cutting disks 13 is set by changing the position of discs, using adjusting screws 18.

The first separating conveyor 6 is a stick type inclined conveyor. The sticks are riveted to three straps with high protrusions at 40 mm spacing. The dug potato separation is increased due to active and passive shakers, as well as large separation area of the conveyor.

The active vibrator 5 and passive shaker 4 have several installation positions from minimum (or no shaking) to maximum conveyor belt oscillation amplitude.

The active vibrator 5 has additional adjustment of oscillation frequency with FRD3 flow regulator/divider.

The potato digging is done by flat plowshares 16 mounted on axle 10.

The digging depth is adjusted by moving supporting rolls 14 with adjusting screws 1.

Cleaning roll 3 is installed to clean the conveyor sticks from soil sticking.

Scrapers are installed to clean the bypass rollers, and plates are installed to clean the belts. The first separating conveyor drive shaft is driven by chain gear from bevel gearbox.

The digging separating block is fixed to the harvester main frame by vertical bars with suspension on hydraulic cylinders (which allows longitudinal and transverse copying of the field surface).

When the harvester is transferred to travel position, the front part of the digging separating block is raised by hydraulic cylinders with installation of safety wire ropes.

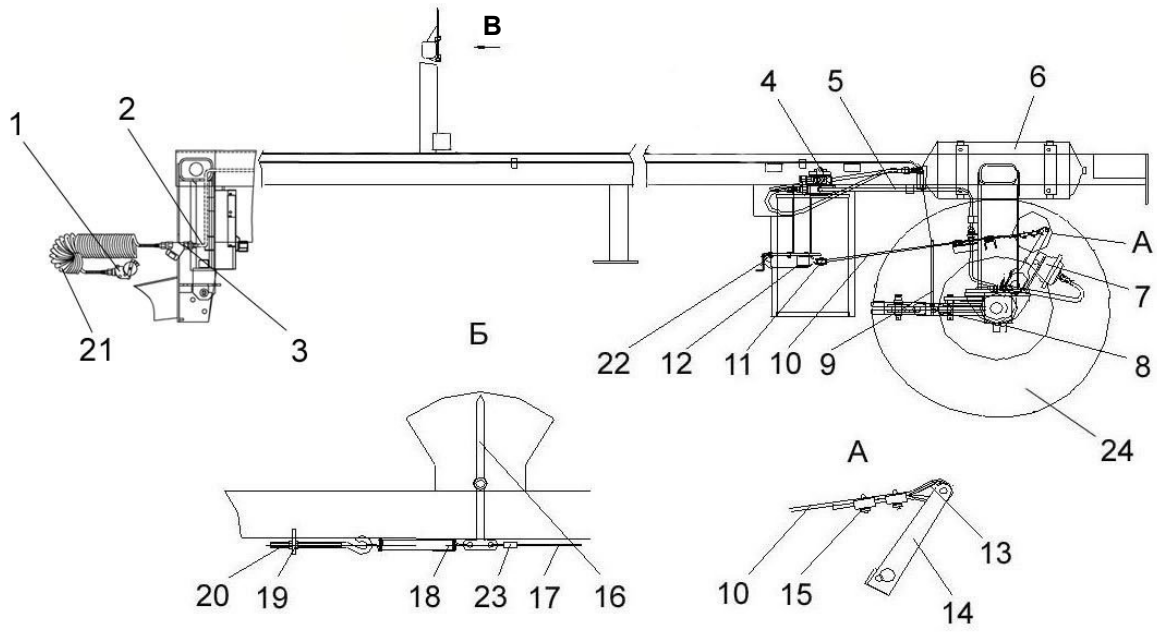
1.3.3 Steering wheels 10 (Figure 1.16) are used to move the harvester and reduce the turning radius during technological turns. The harvester is equipped with drum type shoe brake with pneumatic drive and hand brake with mechanical manual drive.

The pneumatic brake drive makes it possible to actuate the wheel brakes of the harvester simultaneously with the tractor brakes, and also provides emergency braking of the harvester in case of separation from the tractor.

The pneumatic wiring diagram is given in Appendix G (Figure G.1).

When the tractor brake pedal is pressed, the compressed air from the connecting line is released to atmosphere via the tractor brake valve. At the same time, the compressed air from the receiver 6 (Figure 1.4) enters the air distribution valve 4, and than passes to brake chambers 7 via pipelines 5. When the brake is released, the air from the brake chambers 7 is discharged to the atmosphere via the air distribution valve 4.

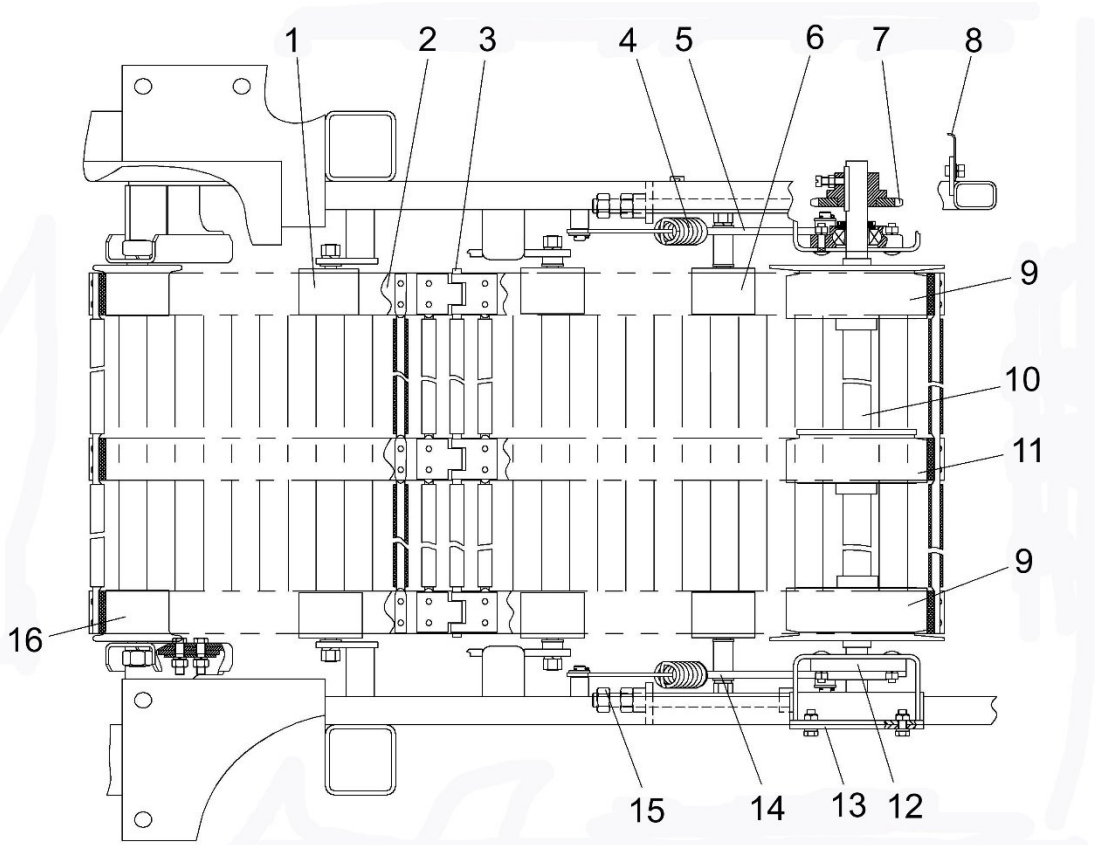
The parking brake is manual with mechanical drive, located on the right side of the harvester. To brake, turn the handle 22 clockwise, to release brake – counterclockwise. The wheel turning is driven by hydraulic cylinder.



1 – connecting head; 2 – pneumatic tube; 3 – line filter; 4 – air distribution valve; 5 – pipeline; 6 – receiver; 7 – brake chamber; 8, 19 – nuts; 9 – pin; 10 – hand brake cable; 11 – tension roller; 12 – hand brake; 13 – rope eye; 14 – lever; 15 – pad; 16 – wheel turn indicator arrow; 17 – wire rope; 18 – spring; 20 – tension bolt; 21 – spiral pneumatic tube; 22 – handle; 23 – clip; 24 – steering wheel

Figure 1.4 – Brake drive and wheel turn indicator installation

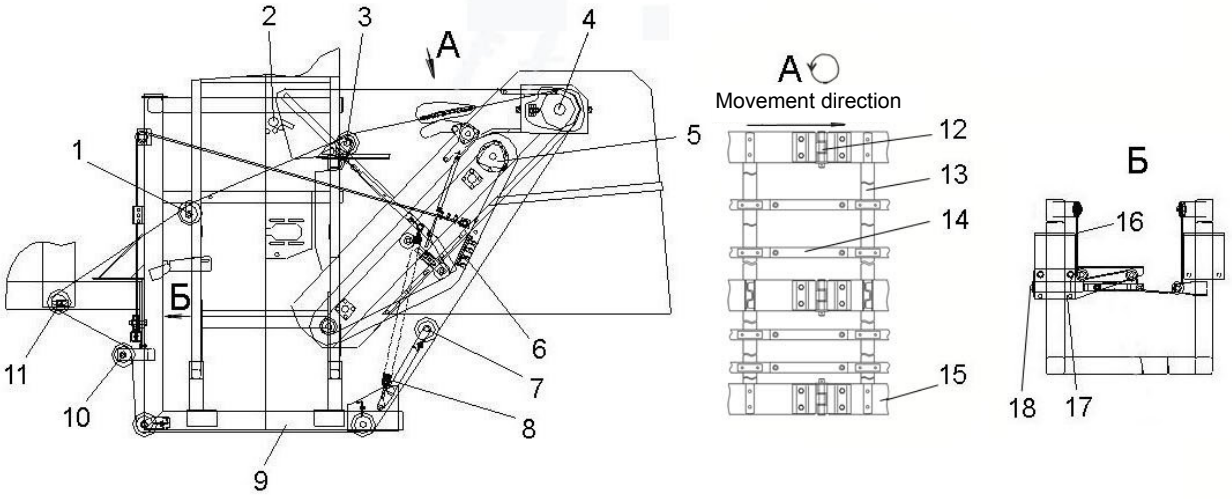
1.3.4 The second separating conveyor is a stick type inclined conveyor. The sticks are fully rubber-coated and riveted to three straps with high protrusions at 40 mm spacing. The dug potato is separated due to large separation area of the conveyor. The drive shaft 10 (Figure 1.5) of the second separating conveyor is driven by chain gear from the first separating conveyor drive shaft.



1, 6, 16 – rollers; 2 – conveyor belt; 3 – conveyor connector; 4 – spring; 5, 14 – brackets; 7 – idler; 8 – flap; 9, 11 – steering wheel; 10 – shaft; 12 – bearing housing; 13 – connector; 15 – pin

Figure 1.5 – Second separating conveyor

1.3.5 The system for separating vine and small impurities consists of a vine removing conveyor 4 (Figure 1.6) and inclined slide 5.



1, 3, 10 – rollers; 2 – bumper plate; 4 – vine removing conveyor; 5 – inclined slide; 6 – separating conveyor; 7 – lever; 8 – spring; 9 – frame; 11 – roll; 12 – belt lock; 13 – stick; 14 – belt; 15 – conveyor belt; 16 – wire rope; 17 – lifter; 18 – adjusting screw

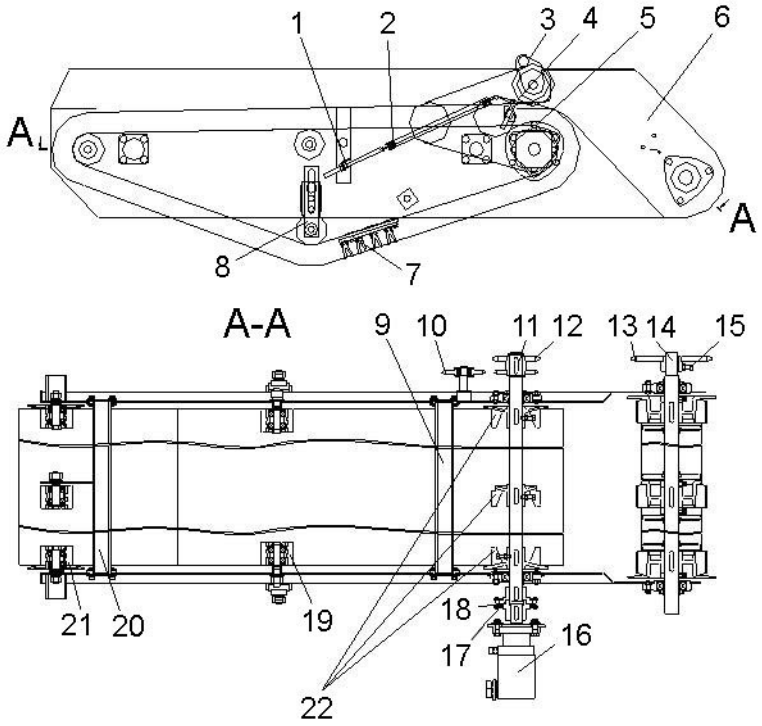
Figure 1.6 – Vine removing conveyor

The vine removing conveyor is designed to separate potatoes from large vine and convey vine by the conveyor belt 15 to its dumping site in the field. Potatoes that have not detached from the vine and are stuck to dense vine and weeds carried by the vine removal conveyor are pushed through by a bumper 2 with plates. Potatoes, small vine and small soil balls are dropped to the conveyor mesh on the inclined slide. The conveyor is driven by a chain gear. The sensor installed on the left side of the harvester near the drive idler of the conveyor is used to monitor the conveyor and inclined slide rotation frequency. When the idler rotation drops below 40 rpm, the TRANSPORTER LED on the harvester control panel lights up.

The inclined slide is designed for further separation of potatoes, in which case potatoes roll down to the buckets 4 (Figure 1.8) of the lifting conveyor, while waste is discharged to the harvested field by the separating conveyor 6 (Figure 1.6).

The slide inclination is adjusted by the lifter 17 (see Figure 1.6) with the help of adjusting screw 18 and wire rope 16. With large amounts of soil balls and plant waste in hopper, the angle of inclination decreases and, vice versa, taking into account potato losses in the harvested field. However, there must be no potato losses and ejection of tubers by the inclined slide. The inclined slide is driven by hydraulic motor 16 (Figure 1.7).

At the top of the inclined slide, there is bumper roller 3 used to separate potatoes that have not detached from the vine and prevent potatoes from being dumped on the field. The bumper roller is driven by a chain gear.



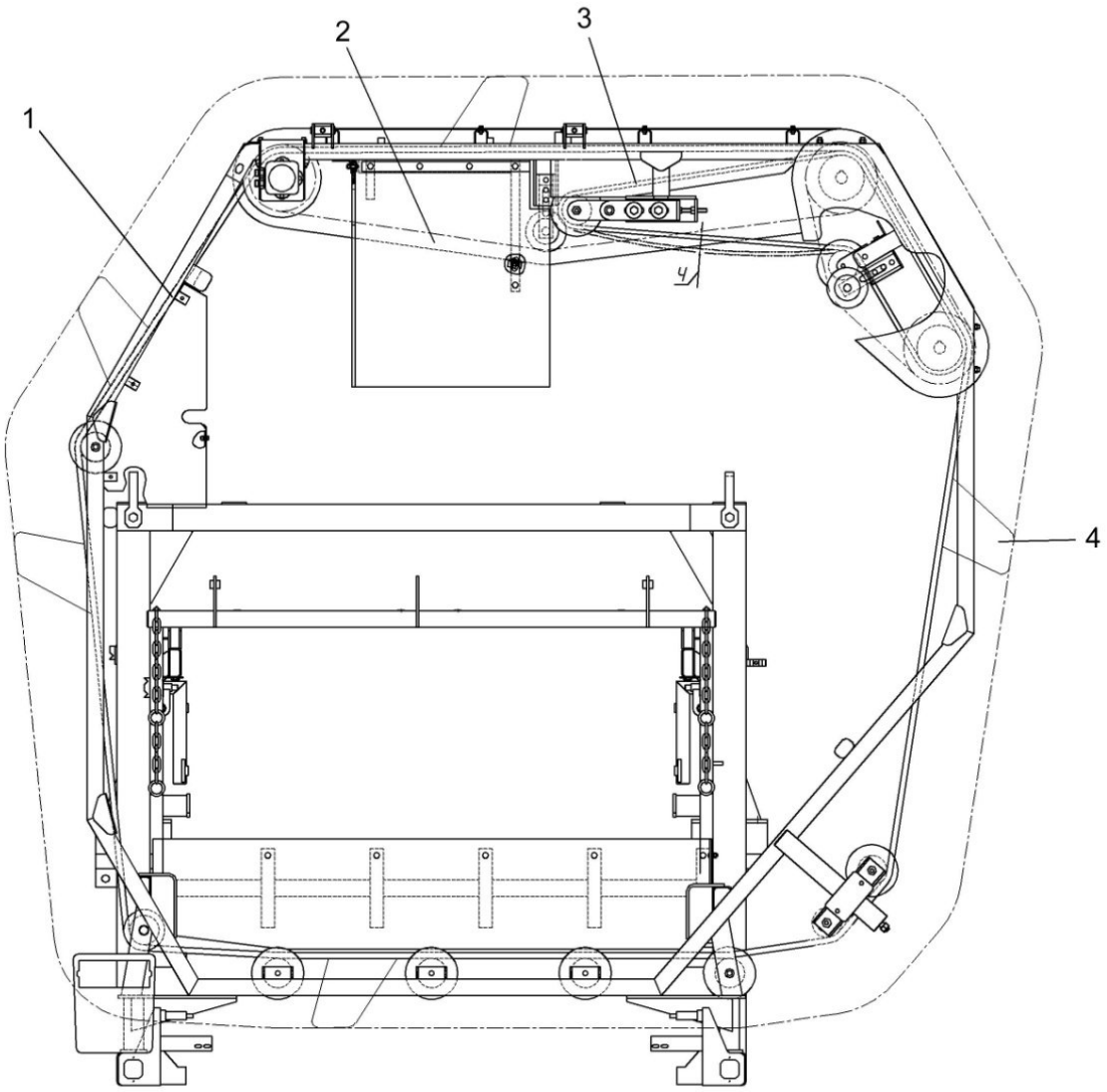
1 – grip; 2 – spring; 3 – bumper roller; 4 – roller; 5 – support; 6 – side wall; 7 – separating conveyor; 8 – tensioning device; 9, 20 – spacers; 10 – chain idler; 11 – shaft; 12, 13 – idlers; 14 – drive shaft; 15 – screw; 16 – hydraulic motor; 17, 18 – toothed half-couplings; 19, 21 – rollers; 22 – drive wheels

Figure 1.7 – Inclined slide

1.3.6 The lifting conveyor consists of: lifting conveyor 1 (Figure 1.8) and accompanying conveyor 3.

The buckets 4 are fixed to the sticks of the lifting conveyor 1 belt. The lifting conveyor is driven by a chain gear 2 from the hydraulic motor.

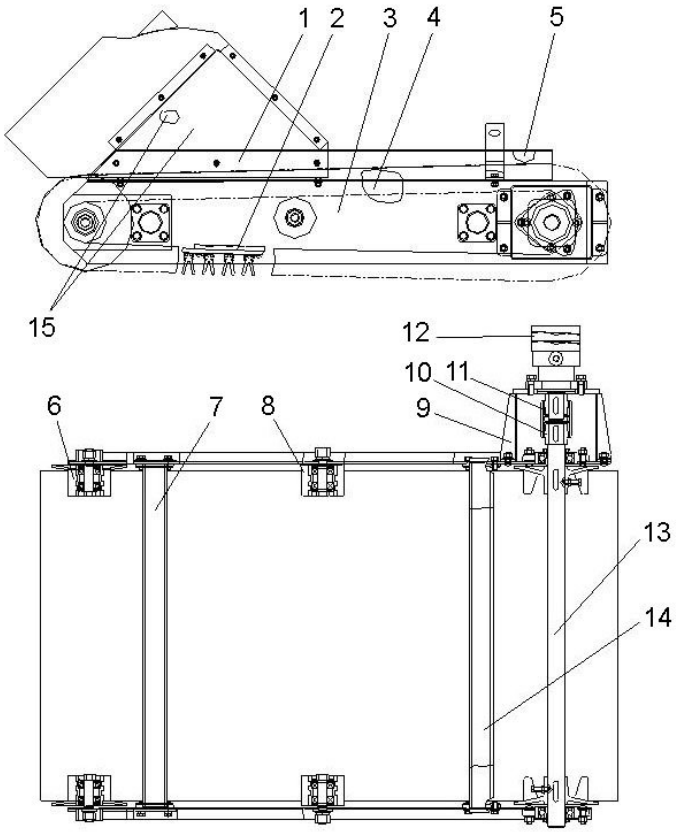
The stick type accompanying conveyor 3 with rubber-coated sticks carries potatoes from the lifting conveyor to the upper inclined slide. The accompanying conveyor is driven by draft shafts of the lifting conveyor.



1 - lifting conveyor; 2 - chain gear; 3 - accompanying conveyor; 4 - buckets

Figure 1.8 - Lifting conveyor

1.3.7 The upper inclined slide (Figure 1.9), which separates potatoes, is an inclined separating conveyor 2 with rubber spikes, along which the potatoes roll onto the hopper loading conveyor, and the remaining impurities are thrown onto the harvested field. The drive shaft 13 is driven by the hydraulic motor 12.

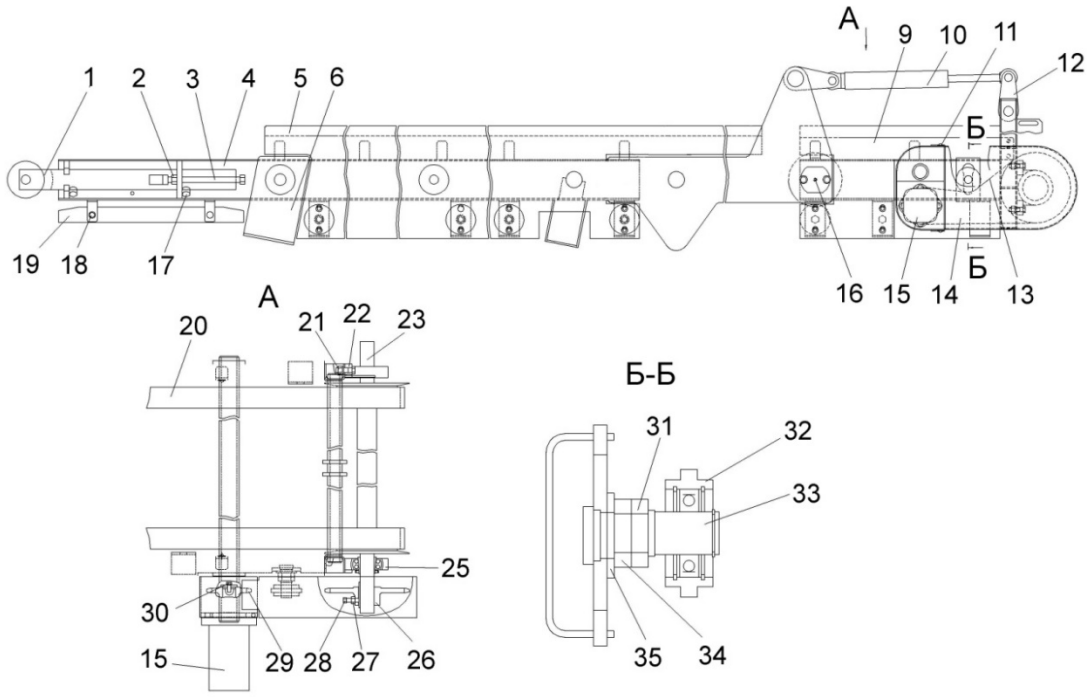


1, 3, 4, 5 – skeleton frames; 2 – separating conveyor; 6, 8 – rollers; 7, 14 – supports; 9 – flange; 10 – half-coupling; 11 – cage; 12 – hydraulic motor; 13 – shaft; 15 – boards

Figure 1.9 – Upper inclined slide

1.3.8 The hopper loading conveyor consists of two sections 4 and 12 (Figure 1.10) and stick type conveyor belt 20. Section 4 is hinged to the frame and is raised and lowered together with the hopper by means of a lifting mechanism connected to the hopper by a flexible link (wire rope), bringing the hopper loading conveyor to the extreme upper or operating position. Rotating on axles 16, section 12 is lowered by means of a hydraulic cylinder 10 to reduce the height of the potato drop into the empty hopper and reduce the number of damaged tubers. At the end of the movable section of the conveyor there is a spring-loaded paddle connected to a limit switch. When the hopper is full, the paddle bumps up against the potato and turns away, and the light (HOPPER LED) and sound signals on the harvester control panel are activated. The sticks of the conveyor are located with 28 mm intervals and riveted to the belt.

To prevent tubers from rolling back, rubber-coated sticks are fixed in brackets on the conveyor belt with 280 mm intervals. The hopper loading conveyor is driven by a chain gear 13 from the hydraulic motor 15.



1, 32 – tension rollers; 2, 27, 34 – nuts; 3 – tension bolt; 4, 12 – sections; 5, 9 – guard rails; 6 – bracket; 16 – axle; 10 – hydraulic cylinder; 11, 28 – screws; 13 – chain gear 14 – shell; 15 – hydraulic motor; 17, 18, 21, 30 – bolts; 19 – damper; 20 – conveyor belt; 22 – housing; 23 – shaft; 25 – bearing; 26, 29 – idlers; 31 – lock nut; 33 – axle; 35 – ribbed plate

Figure 1.10 - Hopper loading conveyor

1.3.9 At both sides of the harvester, there are platforms for sorting workers 5 (for standing work) (see Figure 1.11) with ladders and handrails for four persons who sort potatoes from waste manually. The sorting unit consists of trays for stones and impurities and impurity conveyor 4 which dumps the mass coming from the trays on the harvested field. Both platforms have panels with pushbuttons for emergency stop (stopping operating parts of the harvester with a hydraulic drive), moving the hopper bottom conveyor and voice communication with the operator.

In addition, there are separate emergency stop buttons (per each sorting worker) on the opposite side of both platforms.

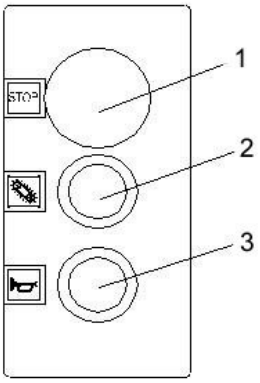
By pressing button 3 (Figure 1.11) on the control panel, a worker can give an audible signal from the work platforms to the tractor driver to indicate that there is a problem.

By pressing button 2 on the control panel, a sorting worker can independently advance the bottom conveyor or unload potatoes to the truck as the hopper fills up.

In emergency cases, sorting workers can stop the process by pressing button 1 on the control panel or a separately installed red MUSHROOM button.

The process can be restarted from the control panel in the tractor cab only.

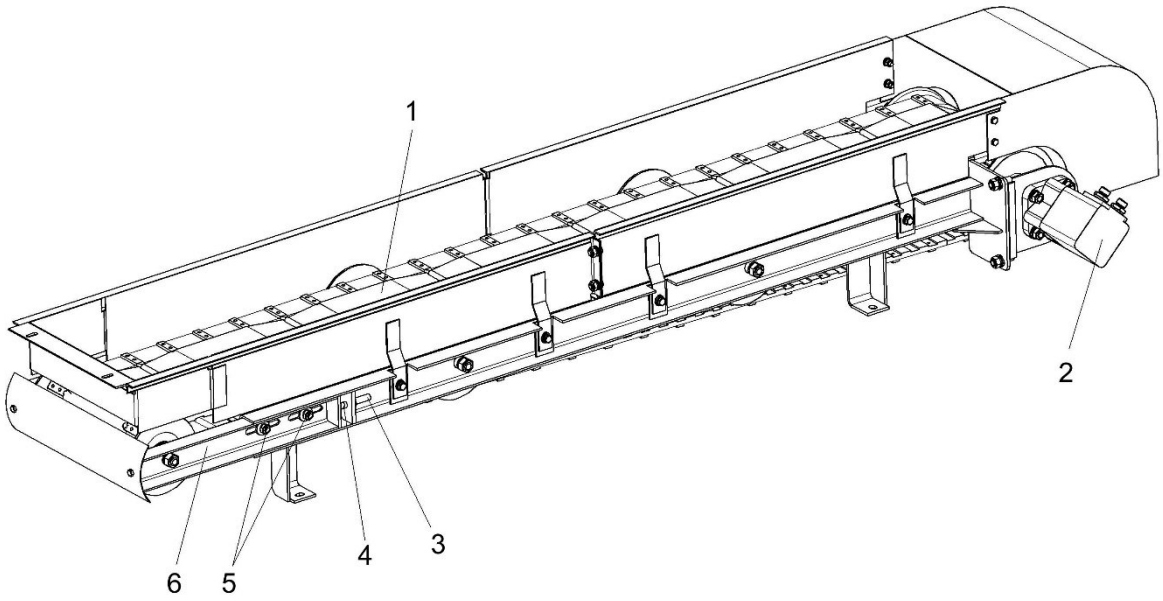
The tractor's audible signal is used for feedback, and sorting workers must be instructed on this before starting work.



1 – button for emergency stop and process blocking; 2 – hopper conveyor start button (mass shift); 3 – audible signal button

Figure 1.11 - Control panel at the platform for sorting workers

1.3.10 Stick type impurity conveyor with belt overlap The conveyor is driven by hydraulic motor 2 (Figure 1.12).

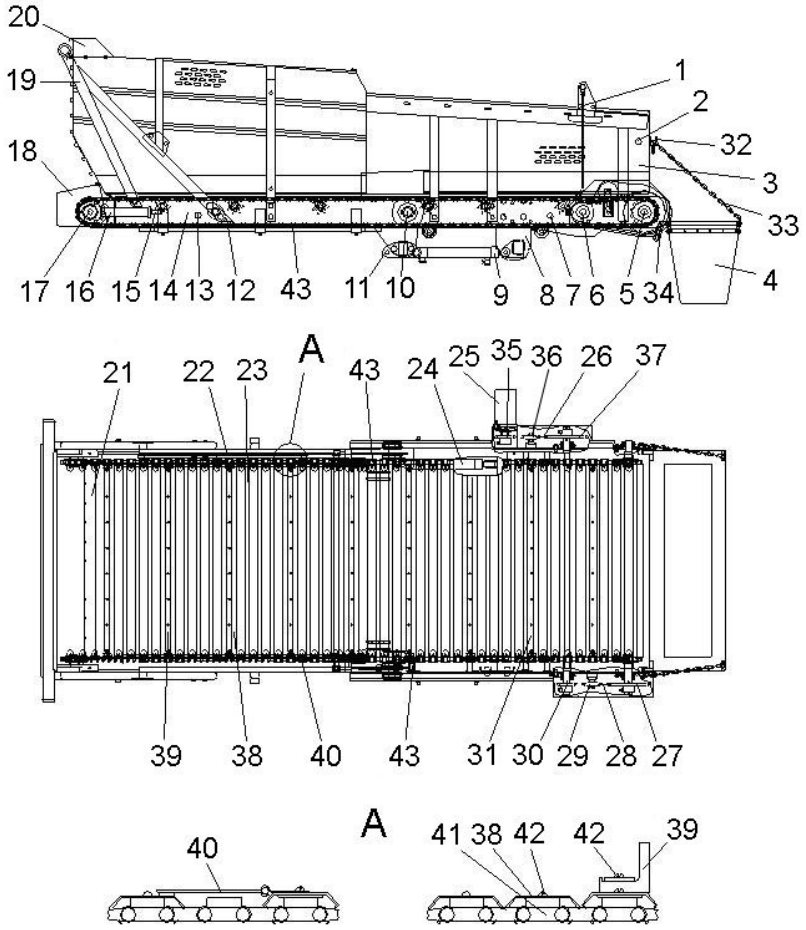


1 – conveyor belt; 2 – hydraulic motor; 3, 5 – bolts; 4 – lock nut; 6 - stretcher

Figure 1.12 - Impurity conveyor

1.3.11 The potato hopper consist of two parts: back one, hinged to the harvester main frame, and front one. The front part is folded to transport position with the help of hydraulic cylinders 9, 24 (Figure 1.13). Potatoes are unloaded to the truck by the hopper conveyor 31 located along the entire bottom of the hopper via a basket 4. The hopper conveyor consists of two conveyor chains and rods fixed to them. A part of rods have rubber pads to prevent potatoes from rolling back to the hopper. In order to avoid damaging potato tubers, the height of potato unloading to the truck shall not exceed 35 cm.

Hydraulic cylinders are used for adjusting the hopper height to the unloading position. The hopper conveyor is driven by a chain gear from the unloading hydraulic motor.



1 – shutter; 2, 3, 22 – boards; 4 – basket; 5, 6, 10, 17 – shafts; 7, 13, 14 – side walls; 8, 11, 12, 16, 19 – supports; 9, 24 – hydraulic cylinders; 15 – stop bolt; 18 – shell; 20 – extension piece; 21 – tailgate; 23 – cross bar; 25 – hydraulic motor; 26 – chain gear; 27, 30, 35, 37 – idlers; 29, 36 – chain idlers; 31 – conveyor; 32 – bracket; 33 – safety chain; 34 – socket; 38 – bar; 39 – scraper; 40 – valve; 41 – connecting link; 42 – screw; 43 - conveyor chain

Figure 1.13 – Hopper

1.3.12 The harvester hydraulic system (Appendix B, Figure B.1) consists of: oil tank T; valve unit VU; operating parts control hydraulic unit HU; electrically controlled valves for operating parts V1 and V2; seven hydraulic motors for driving operating parts M1 - M7; eight hydraulic cylinders for controlling operating parts C1 - C8, and pneumatic hydraulic accumulator with pressure gage.

C1 and C2 hydraulic cylinders are intended to fold the hopper to operating/transport position. They are controlled after switching the remote control panel switch to the HOPPER-FOLDING position (Figure 1.15) and moving the TD1 tractor hydraulic distributor handle to the appropriate position. The hopper folding and unfolding takes place when pressure is applied to the corresponding cavities of the hydraulic cylinders. Together with the hopper unfolding to operating position, the uppermost section of the hopper loading conveyor will be lowered; with the hopper folding to transport position, it will be raised.

C3 and C4 hydraulic cylinders are intended to transfer the digging section of the digging separating block to operating/transport position. They are controlled after switching the remote control panel switch to the DIGGING SECTION position (Figure 1.15) and moving the TD1 tractor hydraulic distributor handle to the appropriate position. Raising – when pressure is applied; lowering – with the tractor hydraulic distributor in floating position. At the same time, together with the digging section lowering, the uppermost section of hopper loading conveyor is raised.

Pneumatic hydraulic accumulator HA is designed for partial relief of the load of the digging separating block front moving part transferred via supporting rolls to ridges due to transfer of a part of the digging section weight to the harvester main frame via C3 and C4 hydraulic cylinders. The digging section weight supports the section lifting hydraulic cylinders that are under pressure and operate with constant (set) force.

C5 and C6 hydraulic cylinders are designed for hopper raising/lowering. They are controlled after switching the remote control panel switch to the HOPPER-RAISING/LOWERING position (Figure 1.15) and moving the TD1 tractor hydraulic distributor handle to the appropriate position. Raising – when pressure is applied; lowering – with the tractor hydraulic distributor in floating position.

C7 hydraulic cylinder is designed to transfer the folding part of the hopper loading conveyor to the lowermost and uppermost position. It is controlled only by moving the TD1 tractor hydraulic distributor handle.

C8 hydraulic cylinder is designed for steering control. It is controlled only by moving the TD2 tractor hydraulic distributor handle.

Hydraulic motors of operating parts are driven by dual hydraulic pump P consisting of two hydraulic pumps (НШ 32 + НШ 20) driven by one shaft. The maximum pressure of the operating parts driving hydraulic system is limited by two safety valves integrated in the VU valve unit and set up for pressure 16^{+1} MPa.

The hydraulic motors are intended for the following drives:

M1 – lifting conveyor;

M2 – upper slide;

M3 – loading conveyor;

M4 – impurity conveyor;

M5 – inclined hopper;

M6 – hopper unloading conveyor;

M7 – active shaker.

When PTO shaft is engaged, the dual hydraulic pump НШ32-20 is driven, in which case:

working fluid is delivered from НШ-20 hydraulic pump to M7 hydraulic motor;

working fluid is delivered from НШ-32 hydraulic pump via electrically controlled valves to the hydraulic system discharge line.

M1, M2, M3, M4 and M5 hydraulic motors are driven by НШ-32 hydraulic pump after switching the remote control panel switch to the TECHNOLOGICAL PROCESS position (Figure 1.15).

M6 hydraulic motor (for driving the hopper unloading conveyor) is driven by НШ-32 hydraulic pump. It performs two operations:

- shifting the mass in the hopper with the technological process being performed after switching the remote control panel switch to the HOPPER CONVEYOR position (Figure 1.15), with all operating parts driven by other hydraulic motors rotating;

- unloading from the hopper (technological process deactivated) after switching the remote control panel switch to the UNLOADING position, with all operating parts driven by other hydraulic motors stopped.

Flow regulators/dividers, hereinafter FRD, are designed to separate the working fluid flows and control hydraulic motor shafts speed.

FRD1, FRD2 and FRD3 flow regulators (Figure B.1) are adjusted at the manufacturing plant and ensure the speed and load on the operating parts' drives to perform a stable technological process in the fields in accordance with agricultural requirements.

FRD1 (installed vertically in the left sorting worker zone) separates the flow from НШ-32 hydraulic pump into B1(»20 l/min) to hydraulic motor M5 (inclined slide and rough-roll conveyor drive) and A1 (»35 l/min) to hydraulic motors M1 (lifting conveyor drive) and M2 (upper slide drive) installed sequentially and the flow regulator/divider FRD2 (installed horizontally in the left sorting worker zone), which separates the flow A1 into A2 (»15 l/min) to hydraulic motor M4 (impurity conveyor drive) and B2 (»20 l/min) to hydraulic motor M3 (hopper loading conveyor (sorting table) drive). FRD3 (installed under the hopper, to the left in the direction of travel of the harvester) is designed to regulate the shaft speed of the hydraulic motor M7 (active shaker drive).

When rotating the RFD1 knob in the direction of increasing the graduation scale, the shaft speed of hydraulic motors M1 (lifting and accompanying conveyor), M2 (upper slide), M3 (hopper loading conveyor) and M4 (impurity conveyor) increases and the shaft speed of hydraulic motor M5 (inclined slide and vine removal conveyor) decreases.

When rotating the RFD2 knob in the direction of increasing the graduation scale, the shaft speed of hydraulic motor M4 (impurity conveyor) increase, and the shaft speed of hydraulic motor M3 (hopper loading conveyor) decrease.

When rotating the RFD3 knob in the direction of increasing the graduation scale, the shaft speed of hydraulic motor M7 (active shaker) increases.

1.3.13 The harvester has lighting equipment for travel on public roads.

All electric equipment is designed for 12 VDC and is supplied by the tractor's power line:

- electric equipment of actuators from portable lamp receptacle (inside and outside the tractor cab);
- lighting electric equipment from the tractor receptacle for connecting additional lights.

The harvester schematic circuit diagram is presented in Appendix D (Figure D.1).

1.3.14 Controls and instrumentation

Hydraulic systems, brake pneumatic system and electric equipment of the harvester are controlled from the tractor cab.

The harvester hydraulic system is controlled with the help of control panel installed in the tractor cab and hydraulic distributor.

Electric wiring of the potato harvester in the tractor cab is shown in Figure 1.14

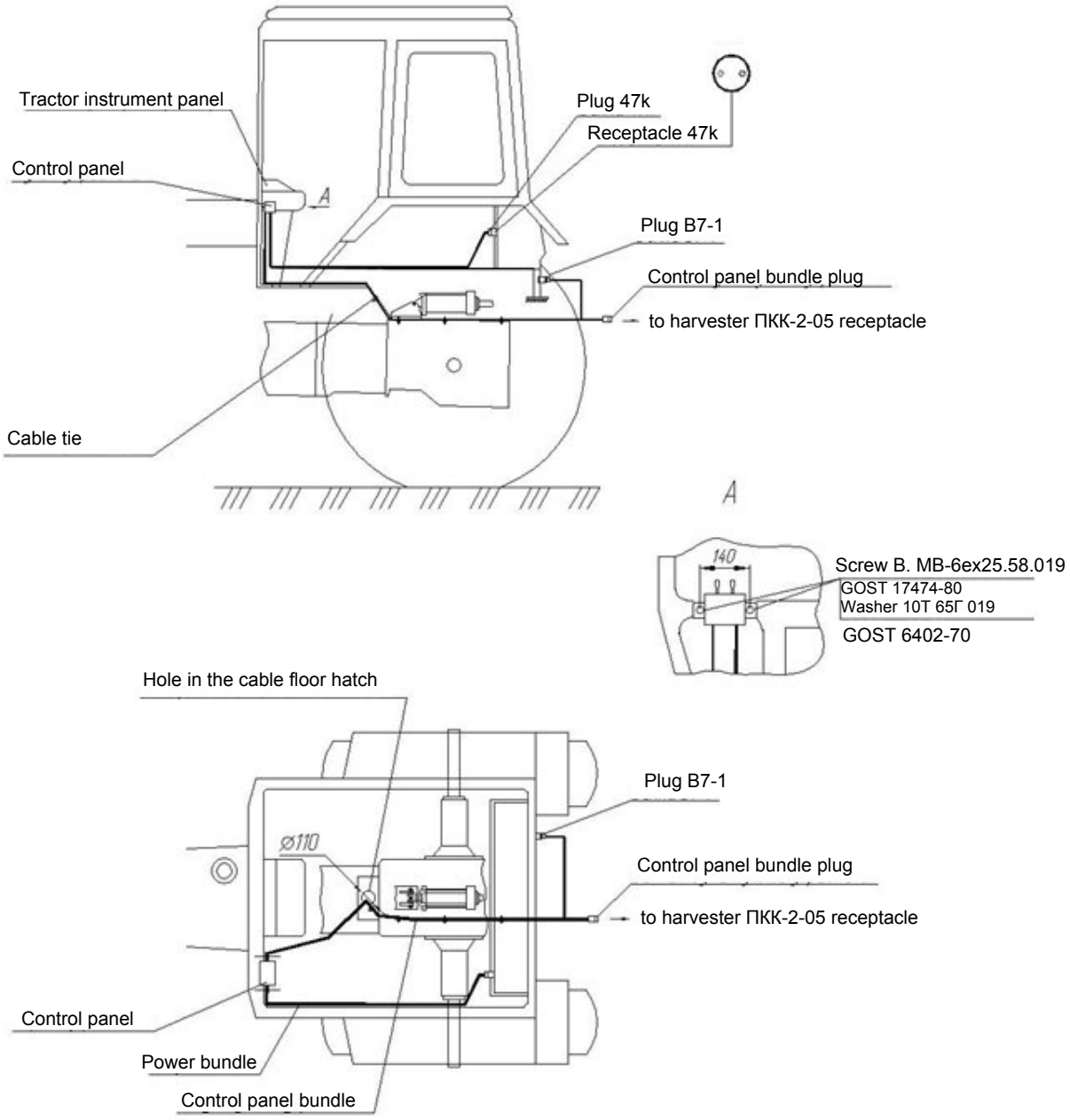
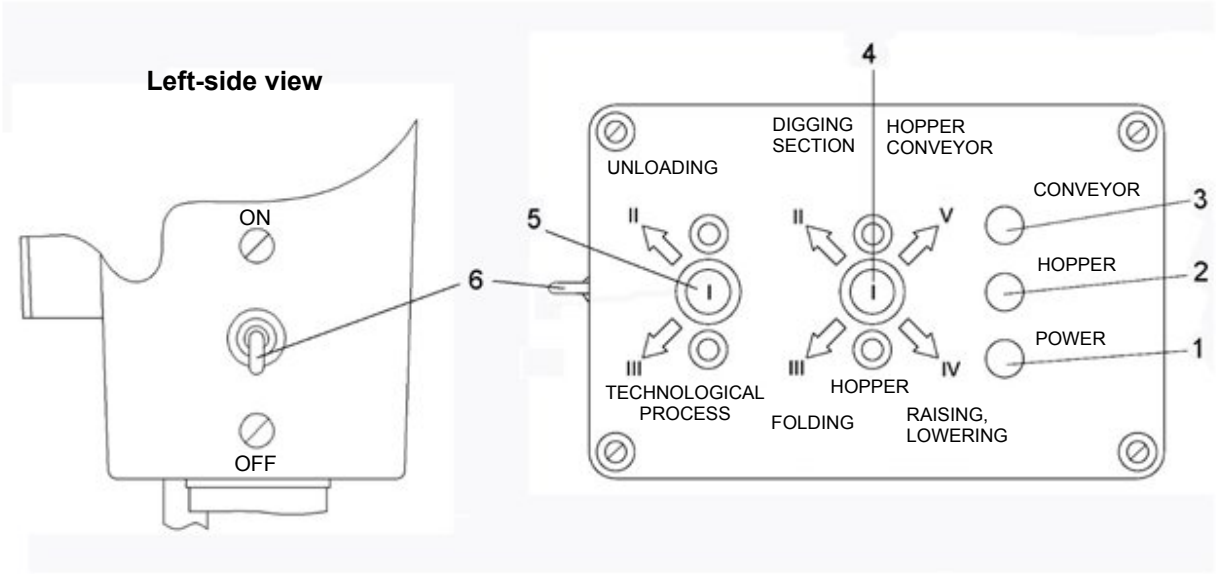


Figure 1.14 – Potato harvester electric wiring in the tractor cab

1.3.15 The harvester control panel is shown in Figure 1.15.



1, 2, 3 – LEDs; 4, 5, 6 – switches

Figure 1.15 – Harvester operating parts control panel

The control panel includes switches 4, 5, 6 and LEDs 1, 2, 3.

The switch 4 has five stable positions:

I – neutral;

II – for transfer of digging section from operating position to transport one and back. To transfer the digging section to operating or transport position, set the switch to position **DIGGING SECTION** and use the knob of respective hydraulic distributor to set the digging section to the required position. When the digging section is in operating position, set the required pressure (per pressure gage) to reduce pressure of depth rollers on the ridges, and than set the hydraulic distributor knob and switch to neutral position;

III – for folding the hopper from operating position to transport one and back. To fold the hopper from operating position to transport one, set the switch to position **FOLDING** and use the knob of respective hydraulic distributor to set the hopper to the required position.

IV – for the hopper raising / lowering together with hopper loading conveyor. To raise / lower the hopper, set the switch to **UP / DOWN** position and use the knob of respective hydraulic distributor to set the hopper to the required position.

V – for hopper unloading (mass shifting). It is used to switch on the hopper conveyor, while the harvester technological process is running.

⚠ **ATTENTION:** Long press will unload the hopper. Press shortly to shift mass in the hopper only!

The switch 5 has five stable positions:
I – neutral;
II – switching on the hydraulic motor of the hopper unloading conveyor;
III – switching on the harvester hydraulic motors responsible for harvesting process;
IV, V – spare.

⚠ **ATTENTION:** In harvesting mode, always set the switch 5 to **TECHNOLOGICAL PROCESS** position before moving off!

1 – **POWER** LED. It is used to control voltage in the harvester power line. If the polarity of connection of the remote control plug to the tractor socket is not correct, the LED will not light up.

2 – **HOPPER** LED. It is used to control filling of the hopper. When the hopper is full, the LED will light up and the buzzer in the remote control will sound.

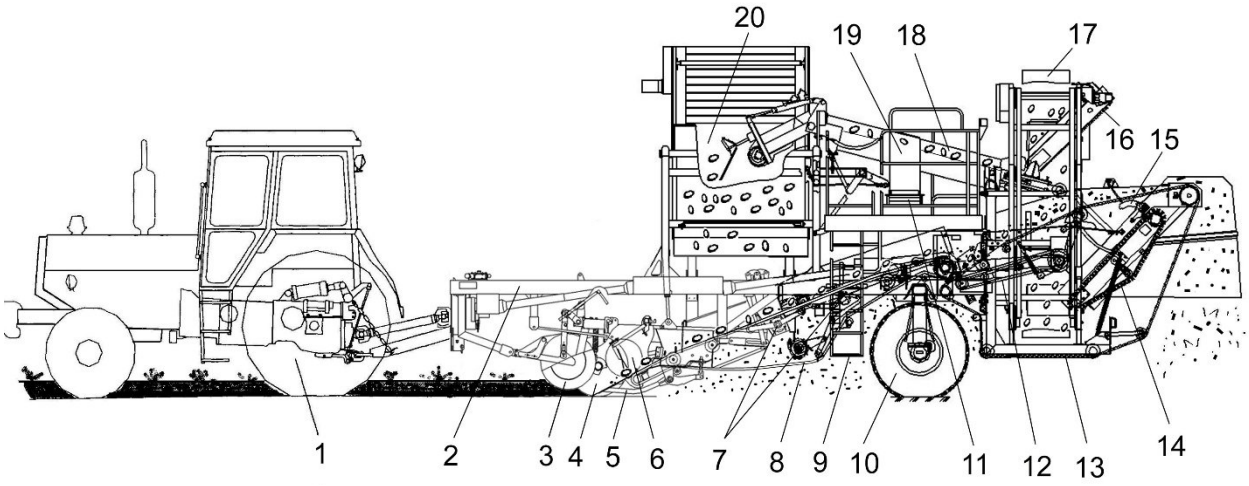
3 – **CONVEYOR** LED. It is used to control speed reduction of the rough-roll conveyor. When the speed drops below 40 rpm, the LED lights up.

The switch 6 has two stable positions:
1 – **POWER** off;
2 – **POWER** on.

1.3.16 Pneumatic brake of the harvester steering wheels is controlled from the tractor cab by pressing the brake pedal via the tractor pneumatic system connected with the harvester pneumatic system.

1.4 Technological process

The harvester technological process diagram is shown in Figure 1.16.



1 – tractor; 2 – frame; 3 – depth roller; 4 – cutting disc; 5 – plowshare; 6 – vine pulling wheel; 7 – active vibrator and passive shaker; 8 – first separating conveyor; 9 – platform with ladder for sorting workers; 10 – steering wheels; 11 – impurity conveyor; 12 – second separating conveyor; 13 – vine removal conveyor; 14 – inclined slide; 15 – bumper roller; 16 – upper inclined slide; 17 – lifting and accompanying conveyor; 18 – hopper loading conveyor; 19 – trays; 20 – hopper

Figure 1.16 – Harvester technological process diagram

When the harvester is moving along the field, the depth rollers 3 (see Figure 1.16), while moving along the planting ridges, copy the field surface and press the ridges thus breaking the mechanical bond of soil and destroying large soil pieces. The cutting discs 4 cut off the vine located to the side of the ridges, cut the ridge layer dug by the plowshare 5, prevent its collapse and direct the incoming mass to the first separating conveyor 8, where the layer is completely destroyed with the help of the leveler, active vibrator and passive shaker 7. The vine pulling wheels 6 located on the sides of the front part of the first separating conveyor 8 push the vine onto the conveyor, preventing its accumulation on the sides of the frame. Vibration on the first separating conveyor 8 causes primary separation of free soil, while the remaining mass enters on the vine removal conveyor 13, where potatoes are separated from the vine. The vine is thrown onto the harvested field, while the potatoes, small vine and small soil balls fall through the cells of the rough-roller conveyor to the second separating conveyor 12, where further cleaning of potato mass takes place. Via the second separating conveyor 12 potatoes with impurities enter the inclined slide 14, where, as a result of separation, soil balls and plant residues are thrown onto the harvested field, and tubers are rolled into buckets of the lifting conveyor. On the top of the inclined slide 14, there is a bumper roller 15, which prevents potatoes from falling onto the field.

The lifting conveyor lifts the tubers in the meshed buckets onto the stick type accompanying conveyor 15, which delivers them to the upper inclined slide 16. While the tubers are lifted, small impurities fall through the cells of the lifting conveyor onto the harvested field. On the upper inclined slide 16, small soil balls and plant residues are thrown onto the harvested field, while the tubers are rolled onto the hopper loading conveyor 18, which serves as a sorting table for manual potato sorting. The sorting workers throw the soil balls, roots and other impurities into the trays 19, from which they enter the impurity conveyor 11 and are thrown onto the field, while the potato tubes drop to the hopper 20. To reduce the drop height, the front part of the hopper loading conveyor 18 is lowered by hydraulic cylinder when the hopper is empty, and is raised when it is full. To fill the entire volume of the hopper, potatoes are moved by the hopper bottom conveyor.

To empty the hopper 20, it should be raised to unloading position (the raising height depends on the height of boards of the approaching truck) by hydraulic cylinders. The hopper loading conveyor 18 is raised together with the hopper via flexible wire rope link. The bottom conveyor of the hopper is switched on, which unloads the potato tubers into the truck.

2 Use as intended

2.1 Harvester preparation for use

2.1.1 Preparation of the harvester for use by dealer center specialists includes pre-sale preparation consisting of the following operations:

- checking completeness of harvester;
- depreservation;
- further assembly and running in;
- elimination of faults found;
- instructing operators on the rules of operation, maintenance and storage of the harvester.

The list of dealer centers in the Republic of Belarus is given in Appendix K.

The harvester is shipped from the manufacturing plant as full set partially disassembled.

Spare and dismantled parts, accessories and tools are placed into the SPTA box.

The harvester preparation for use operations include depreservation, further assembly, adjustment and running in.

 When preparing the harvester for operation, remove the transport link installed for securing the hopper and the frame of the harvester during shipment to the customer.

 **IT IS PROHIBITED** to operate the harvester with the transport link not removed.

2.1.2 Depreservation

Before the harvester operation, do the following depreservation operations:

- remove package from outer surfaces of parts;
- perform depreservation as specified in paragraph 5.6;
- remove the plugs.

2.2 Further assembly

2.2.1 General instructions on further assembly

The further assembly area must be smooth and clean.

Before further assembly, check the condition of dismantled assembly units and parts, as well as fixtures. Eliminate all the defects found before installation of the assembly units and parts on the harvester.

Lubricate all the hinged connections (axle connections, etc.) with solid oil before assembly. Check for lubrication and proper installation of rubber seals in bearing housings.

Eliminate all the defects found.

The harvester further assembly shall be done by two persons, subject to compliance with occupational safety rules and use of lifting and handling devices.

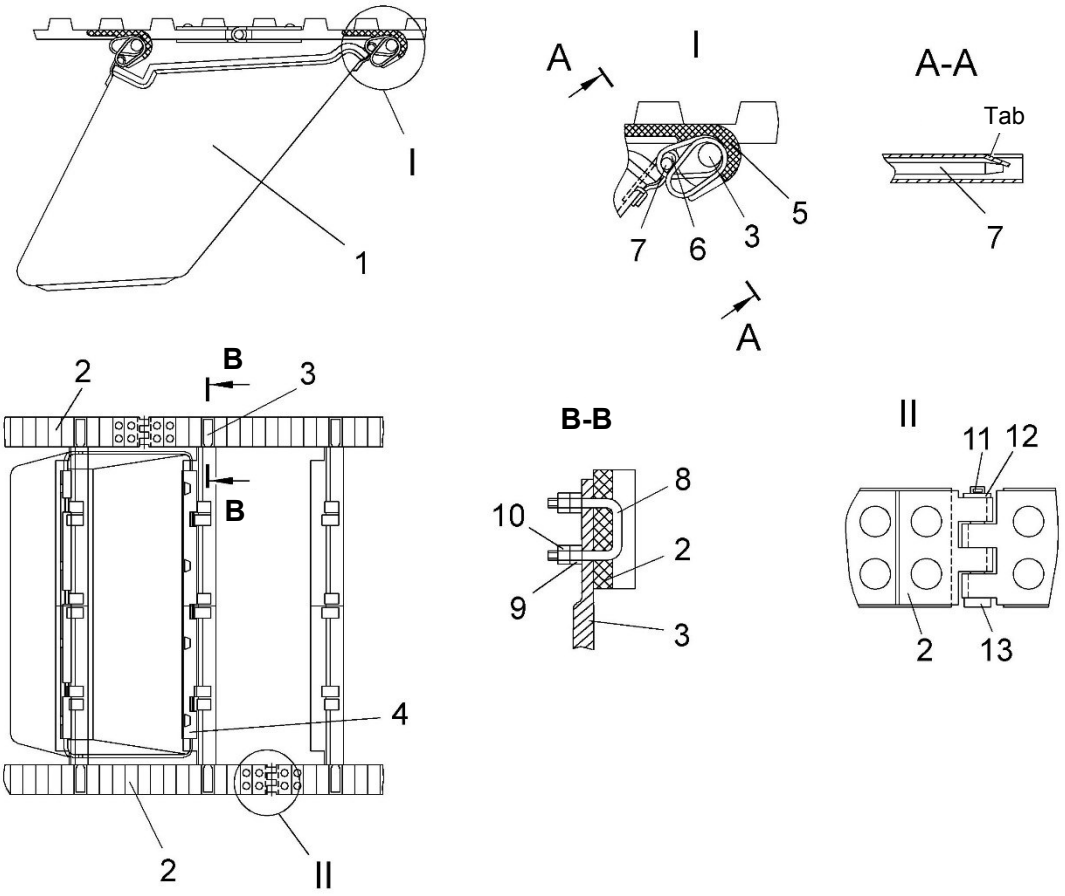
2.2.2 Put the steering wheels of the harvester (if removed before shipment) on the wheel axle hub and fix with nuts with the torque from 274.58 to 313.81 N·m. Set the tire pressure to 0.37 MPa.

2.2.3 Install the dismantled electric equipment using the schematic circuit diagram (Appendix D, Figure D.1).

Install the following on the harvester: at the rear – left and right lights and two red reflectors; at the front – two white reflectors; at both sides – yellow reflectors.

Install vertically and secure racks with control stations at maintenance sites.

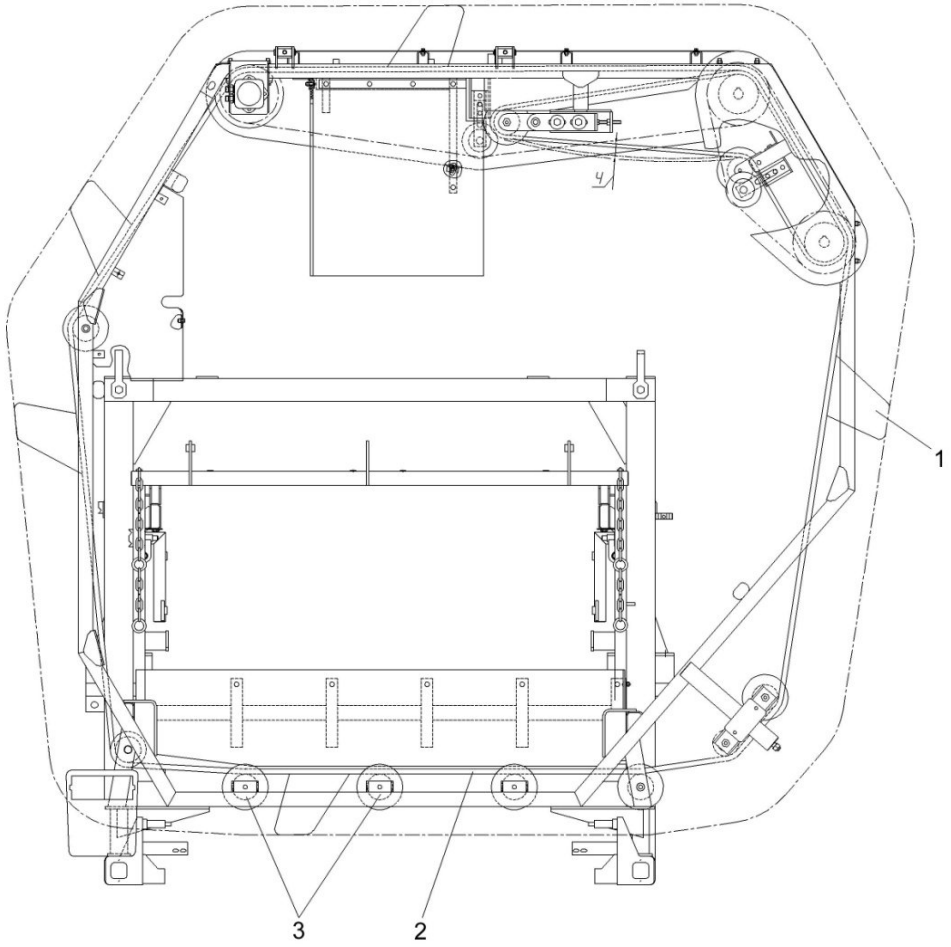
2.2.4 Install the lifting conveyor dismantled before shipment. Do it as shown in Figure 2.1 in the following order:



1 – bucket; 2 – belt; 3 – stick; 4 – bucket rod; 5 – protective case; 6 – hinge; 7, 13 – axles; 8 – bracket, 9 – nut; 10 – lock nut; 11 – splint; 12 – washer

Figure 2.1 – Lifting conveyor further assembly order

- remove the lifting conveyor 1 (Figure 2.2) from the hopper (placed before shipment);



1 – lifting conveyor; 2 – belts; 3 – rollers

Figure 2.2 - Lifting conveyor

- mount the lifting conveyor **so that the belts 2 rest on the lower rollers 3**;
- connect the ends of the belts 2 (see Figure 2.1) by axles 13 (see Figure 2.1, **II**) installed before shipment on one of the belt loops and fix with the help of washers 12 and lock splints 11;
- connect the stick 2 (see Figure 2.1, B-B) with belt 2 with the help of the bracket 8 and fix with nuts 9 and lock nuts 10, cut off the protruding loose ends of the bracket (if necessary, deburr or screw the cut ends of the bracket).
- install bucket 1 opened during dismantling, for which: connect openings of bucket rod 4 with hinges 6 (see figure 2.1, I); insert axle 7 into bucket rod 4, whereby the axle should alternately connect all hinges. To prevent the axle from falling out during work, bend the tabs on the rod 4 (see Figure 2.1, A-A) on both sides.

2.2.5 Install the ladders dismantled before shipment.

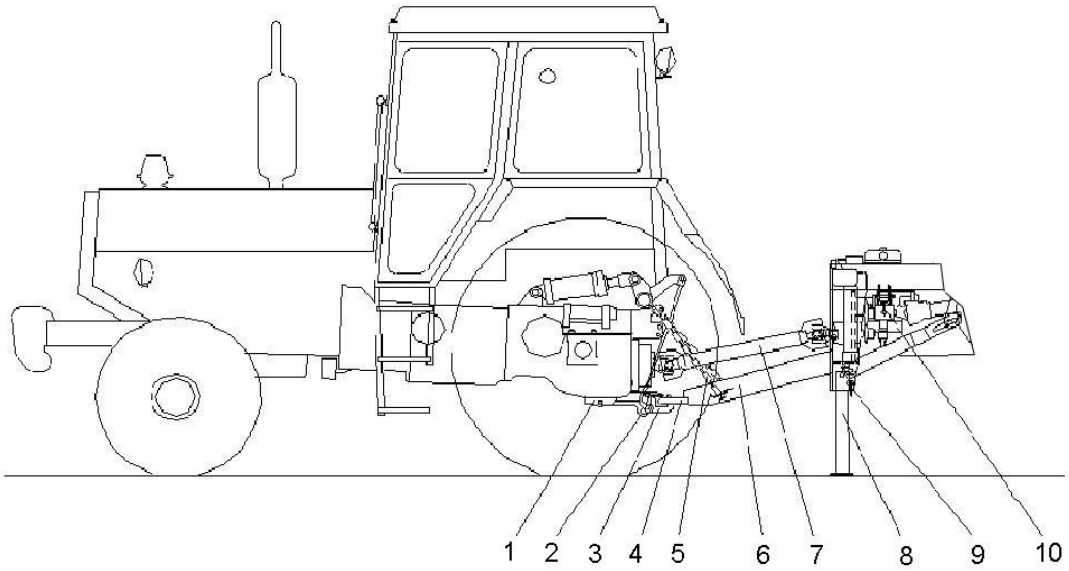
2.26 Connect the hopper lifting hydraulic cylinders disconnected before shipment.

2.3 Harvester matching with tractor

2.3.1 The harvester is matched with MTZ-80 and MTZ-82 tractors equipped with hydraulic hook, modular hydraulic system, braking system pneumatic drive terminals and electric equipment with switch and breaker of turn indicators.

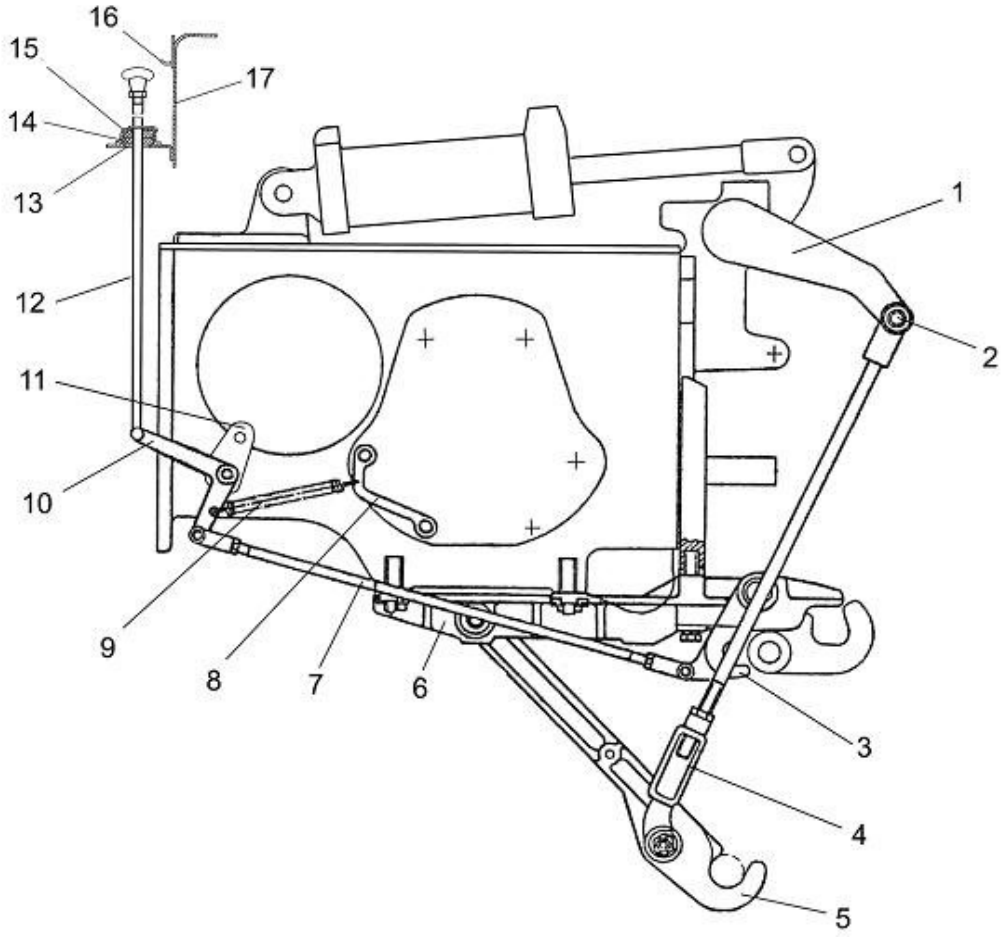
2.3.2 Prepare the tractor for matching with the harvester as follows:

- turn off the tractor engine, set the track of front and rear wheels 1400 mm for working with the harvester on 70 cm row spacing, 1500 mm - on 75 cm row spacing, 1800 mm - on 90 cm row spacing (set in accordance with the tractor operating documentation);
- set tire pressure as specified in the tractor operating documentation;
- remove the upper pull rod of the tractor hitch and secure the safety chains to the frame brackets;
- install the bracket 1 (Figure 2.3) with hydraulic hook 3 (install the hydraulic hook and prepare it for work in accordance with the tractor operating documentation) and bolt it to the lower part of the rear axle. Install the bracket 6 (Figure 2.4) with hook 5 and attach it with special bolts to the rear axle bottom and PTO shaft cover. With pull rods 4, the hook is connected with fingers 2 of outer levers 10 of the hitch mechanism. Grips shall be installed on the bracket axle. Having raised and fixed the position of handle 12, adjust the length of the pull rod so that when lifting the hook there is a gap of 2...3 mm between the grips and the hook axle. Adjust the hook pull rods so that when lifting to the highest position the grips release the hook axle (further according to the tractor operating documentation);



1 – hydraulic hook bracket; 2 – grip; 3 – hydraulic hook; 4 – towing ring; 5 – safety chain; 6 – draft bar; 7 – propeller shaft; 8 – parking leg; 9 – locking handle; 10 – counter drive

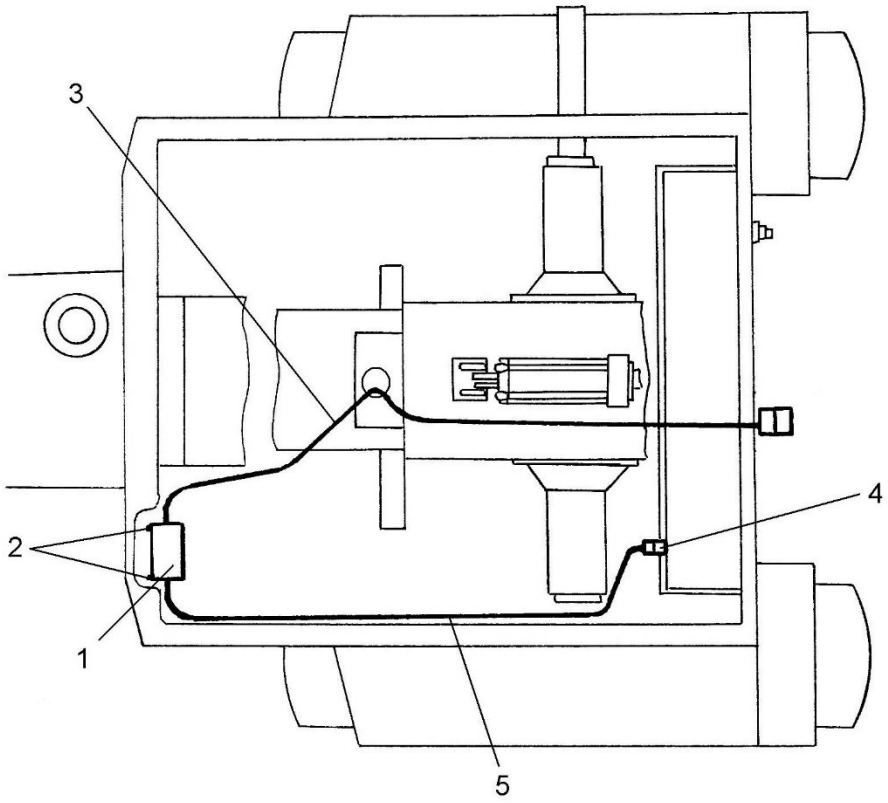
Figure 2.3 – Harvester matching with tractor equipped with hydraulic hook



1, 10 – levers; 2 – finger; 3 – grip; 4, 7 – pull rods; 5 – hook; 6, 8, 16 – brackets; 9 – spring; 11 – flange; 12 - handle; 13 – cab floor; 14 – housing; 15 – gland; 17 – floor vertical panel

Figure 2.4 – Hydraulic coupling hook
(in down position)

- fix the control panel 1 (Figure 2.5) in the tractor cab with two screws 2 (B.M8-6ex25) with washers. Connect the cable bundle 5 (КПК 0700060) to the tractor receptacle 4. Route the cable bundle 3 (КПК 0700050) through the hatch opening in the cab floor and lead it outside. Attach the cable bundles to the fixed elements of the tractor with cable ties (УКА 0700023).



1 – control panel; 2 – screws with washers; 3, 5 – cable bundles; 4 – tractor receptacle

Figure 2.5 – Control panel layout in the tractor cab

- install four high-pressure hoses with hydraulic half-couplings on the hydraulic leads of the tractor to be matched.

2.3.3 The harvester matching with tractor must be done on a level horizontal site in the following order:

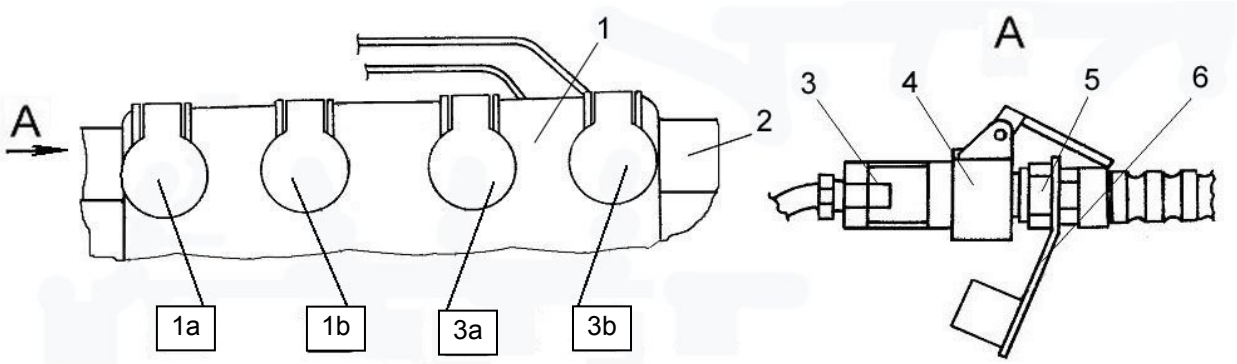
- harvester wheels should be braked with hand parking brake with wheel blocks placed and draft bar mounted on parking leg 16 (see Figure 1.1);
- having released grips 2 (see figure 2.3) from load, lower the tractor hydraulic hook 3;
- having warned others by sound signal, back up the hydraulic hook 3 under the towing ring 4 of the draft bar 6 of the harvester;
- lift the hydraulic hook 3 with the help of hydraulic system and connect it with the towing ring 4;
- fix the hydraulic hook 3 by grips 2 with a knob in the tractor cab;
- bring the tractor to a stop by parking brake and stop the tractor engine;
- throw the safety chain 5 over the upper pull rod brackets of the tractor's rear hitch and secure it to the harvester draft bar eye;
- connect the harvester propeller shaft end yoke to the tractor PTO shaft and fix it with spring locks.

The end yokes of the propeller shaft joints must lie in the same plane. Fasten the chains of the protective cover to the fixed parts of the tractor hitch and to the draft bar of the harvester.

⚠ **ATTENTION:** After the chains of the protective cover are fixed, the propeller shaft shall have sufficient range of turning in all working positions!

⚠ **DO NOT** use the chain to suspend the propeller shaft.

- connect the tractor's hydraulic system with that of the harvester with the help of high pressure hoses and hydraulic half-couplings previously connected to the hydraulic leads of the tractor by connecting half-couplings to paired hydraulic leads [1a], [1b] and [3a], [3b] (Figure 2.6) on the harvester panel, having previously cleaned the half-couplings from dirt. Connecting uncleaned half-couplings will cause damage to the harvester's hydraulic system;



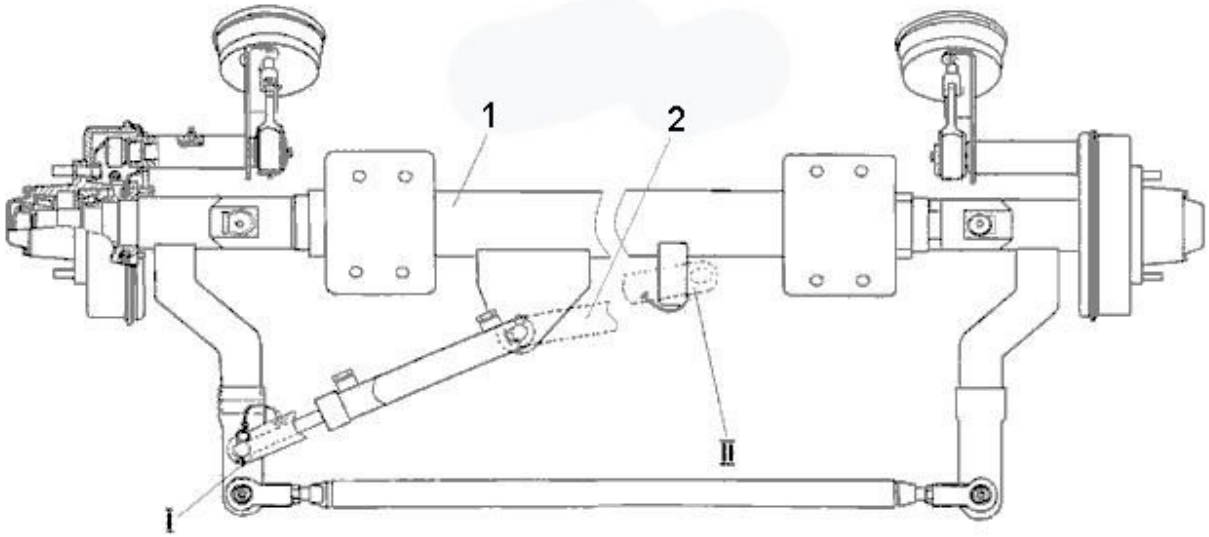
1 – flap; 2 – frame; 3 – outer half-coupling; 4 – locking device; 5 – inner half-coupling; 6 – plug

[1a]; [1b]; [3a]; [3b] – paired hydraulic leads

Figure 2.6 – Harvester hydraulic system leads

- connect the socket of the control panel with the socket of the harvester, plug the plug of the lighting and signaling equipment into the tractor socket and lower the locking cover;
- connect the hose head of the harvester pneumatic brake system to the tractor's brake system head;
- lift the paring leg 8 (see Figure 2.3) and lock it with locking handle 9;
- open the shut-off cock of the tractor's pneumatic system;
- release the parking brake by turning the handle counterclockwise until it stops;
- remove the wheel blocks from under the wheels and install them on the harvester;
- check that braking system, hydraulic systems and electric equipment work properly.

Before start of the harvester work in the field and when it is necessary to turn the harvester with minimum radius, unbolt locking plate 2 (Figure 2.7) and lock it in position **II**. During transport travels, the locking plate 2 must be locked in position **I**.



1 – wheel axle; 2 – locking plate

Figure 2.7 – Running swivel wheels axle

2.3.4 Harvester disconnection from tractor

To disconnect the harvester from the tractor with hydraulic hook:

- park the tractor with the harvester on level horizontal ground;
- transfer all operating parts of the harvester to transport position;
- stop the harvester with parking hand brake, stop the tractor's engine and put wheel blocks under the running swivel wheels;
- put down the parking leg 8 (see Figure 2.3);
- disconnect the safety chain 5 from the draft bar clinch and remove it from the bracket of the upper pull rod of the tractor rear hitch;
- put the hydraulic hook to down position;
- disconnect the electric, pneumatic and hydraulic system;
- move the tractor ahead and raise the hydraulic hook to up position.

2.3.5 Once the harvester is disconnected from the tractor, the tractor can be used for other work, in which case the harvester is in stable position. Stability must be kept on hard surface with slope up to 8,5º in any direction.

2.4 Running-in

2.4.1 Running-in of a new harvester is mandatory before putting it into operation. Proper running-in is a prerequisite of durable harvester operation. The running-in period is necessary to ensure running-in of the rubbing surfaces of the parts; and, therefore, the engine should not be loaded to full power.

2.4.2 Preparation for running-in

Before the harvester running-in start, match the harvester with tractor (paragraph 2.3), install and lock all protective covers and caps.

Check carefully:

- interaction and correct installation of all assembly units and mechanisms, and all outside fastenings;
- connections of hydraulic cylinders with pull rods and levers, as well as leak tightness of oil pipelines within the hydraulic system.

In the event of leaks, find the causes and eliminate them immediately.

- drive chains and springs tensioning;
- if any tools or other objects are left in the operating parts.

2.4.3 Running-in

Running-in is a mandatory operation before putting harvester into operation.

Make sure there are no people near the harvester and the tractor.

Switch on the control panel with switch 6 (see Figure 1.15) and transfer the digging separating block to operating position.

Engage the PTO shaft with the digging section lowered to operating position.

Give sound signal of PTO shaft engagement.

Start the running-in with the engine speed of 16.7 - 20 s^{-1} (1000 - 1200 rpm) with further increase of the speed to the rated value of 36.7 s^{-1} (2200 rpm).

During the running-in, with PTO disengaged and tractor engine switched off, check:

- the heat rate of bearing units. The heating temperature shall not exceed the ambient temperature by more than 40 ºC;
- the heat rate of the working fluid in the hydraulic system of the harvester. The maximum allowable heating temperature is ≈ 50 ºC at ambient temperature of 20 º $\pm$ 5 ºC.
- tightness of all bolted connections;
- lowering the moving parts, which should be smooth, without jerking or shaking.

In case of normal operation of all mechanisms at idle speed, gradually increase revolutions to nominal and continue cranking the operating parts of the harvester.

If there any unusual sounds, immediately find the source and eliminate the cause.

2.4.4 Run in the new harvester first at least two hours at idle speed, followed by 8-10 hours under load on light work.

After the running-in is finished, do technical maintenance No.1 (TM-1). Do all the operations with PTO shaft disengaged and tractor engine switched off.

2.5 Harvester reconfiguration procedure

2.5.1 Harvester reconfiguration for 75 cm row spacing

Loosen bolt connections 4 pcs. (nuts with M16 bolts) of holders for roller installation in the digging separating block and symmetrically with respect to the center extend the frames with rolls from the size of 700 mm (factory setting) to the size of 750 mm between the centers of rolls. Tighten the loose nuts.

2.5.2 Harvester reconfiguration for 90 cm row spacing

Reconfigure the harvester as follows:

- remove the vine pulling wheels assembled with the lever (2 pcs) from the digging separating block, having previously unscrewed the screw connections and removed the two supports and two springs;
- remove the axle with installed plowshares from the digging separating block, having previously unscrewed the screw connections and released all cotter pins;
- reinstall (swap) the end plowshare inserts on the axle. Unbolt and remove the roll frame installation axle on the harvester main frame (in the front part);
- loosen 4 nuts M16 fixing holders for rolls and bolts with nuts fixing the four discs on the hitch beam in the digging separating block. Symmetrically with respect to the center extend the frames with rolls from the size of 700 mm (factory setting) to the size of 750 mm between the centers of rolls.

Install the axle with reinstalled plowshares in the digging separating block in reverse order. Install the cutting discs in pairs symmetrically with respect to the plowshare (identical gaps ≈ 22 mm between the discs and the plowshare). Tighten the loose bolts and nuts of cutting discs and rolls on the hitch beam. Install the frames of rolls on the main frame and secure them with an axle.

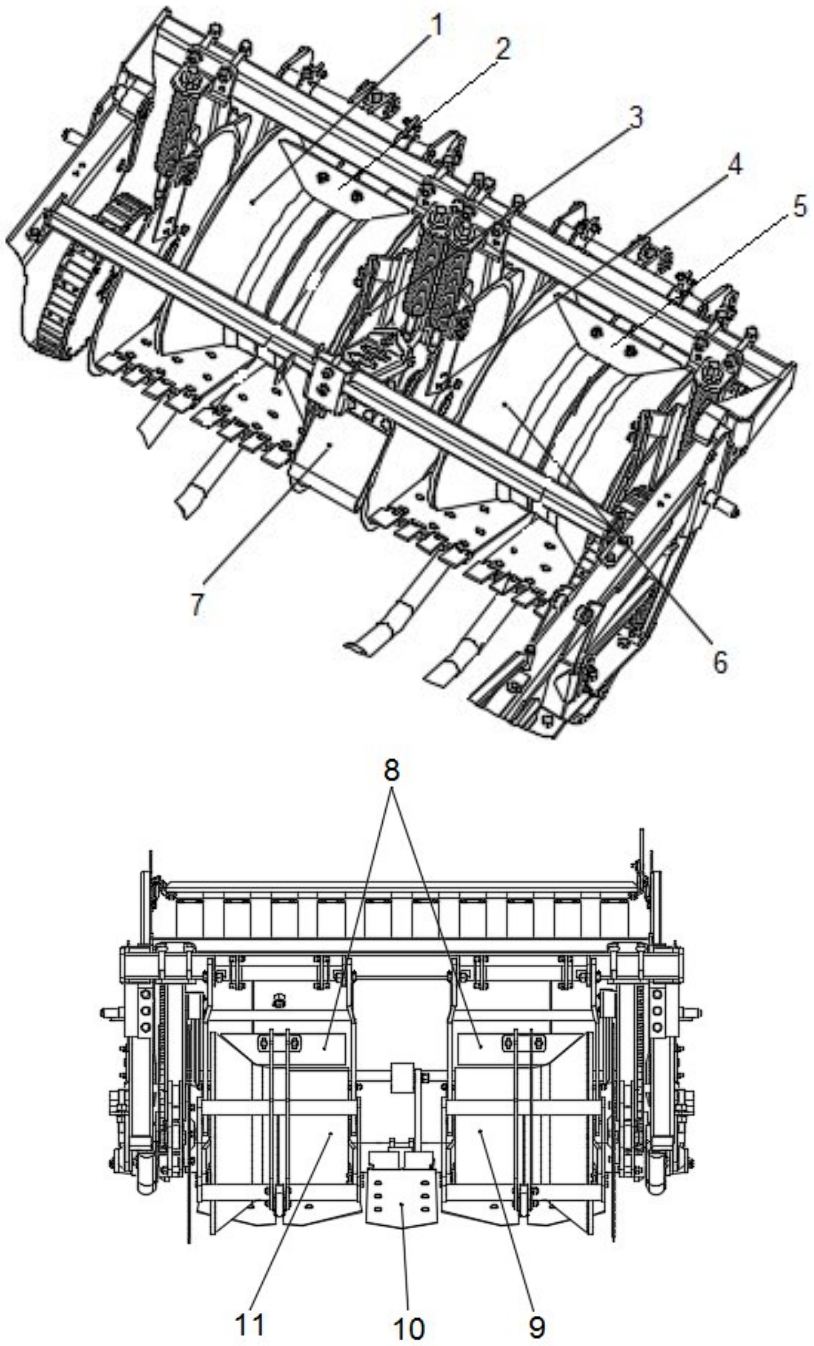
- dismantle the valve apron installed in the middle between the inner cutting discs. Instead of it, install the apron for 90 cm row spacing and secure it.

2.5.3 Harvester reconfiguration for the use of the first separating conveyor belt set with 44 mm span

Reconfigure the harvester as follows:
- remove the first separating conveyor belt with 44 mm span installed on the harvester (main set);
- remove the drive shaft assembled with the wheels;
- remove the cleaning roll installed on the tensioning device of the first separating conveyor;
- install the drive shaft with rubbered wheels (reinstall drive idlers with chains from one shaft to another one) from the set;
- install the first separating conveyor belt with 44 mm span from the set;
- in the digging separating block (Figure 2.10) install the layer leveler 17 with minimum pressing rubber plates to the conveyor sticks or dismantle it from the harvester (not required on light soils);
- adjust the active vibrator 5 and passive shaker 4 (Figure 2.10) in accordance with the recommendations on adjustment of the first separating conveyor (paragraph 2.7.5).

2.5.4 Harvester digging block reconfiguration for central plowshare installation

To reconfigure the digging block of the harvester, remove the valve 7 (Figure 2.8), discs 3 and 4, rolls 1 and 6, and scrapers 2, 5.

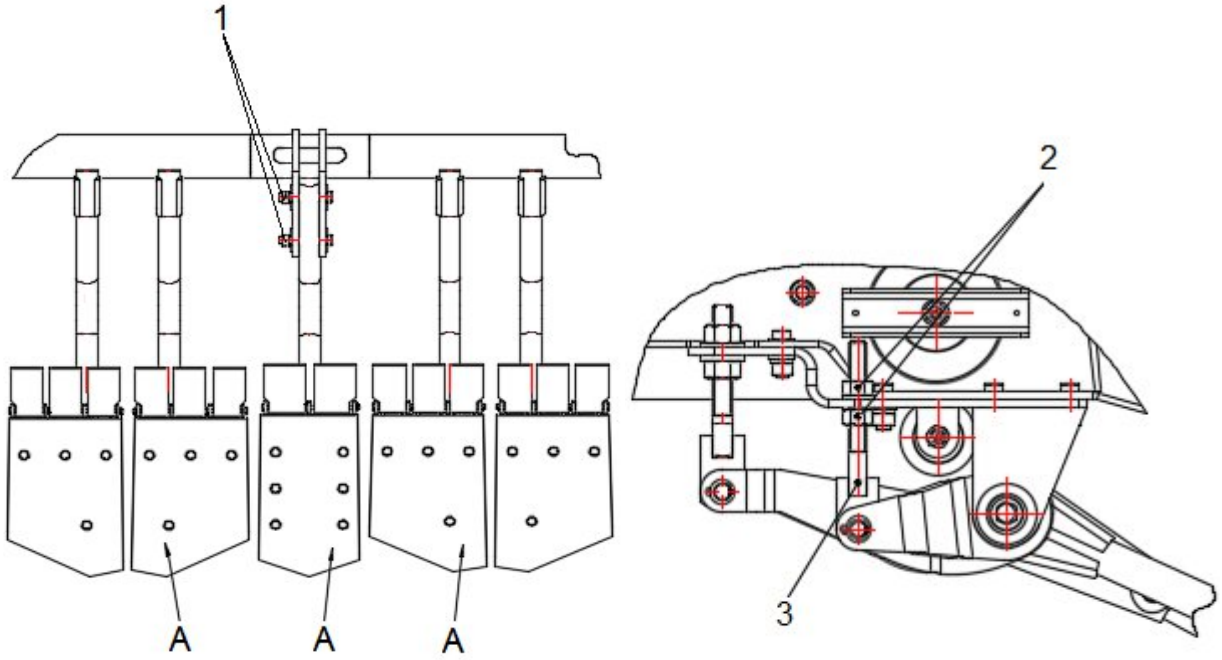


1, 6 – rolls (КПК-5-0104410); 2, 5 – scrapers (КПК-5-0104438А); 3 – disc (КПК-5-0104140); 4 – disc (КПК-5-0104140-01); 7 – valve (КПК-5-0103110); 8 – cleaning scrapers (КПК-5-0104465); 9 – roll (КПК-5-0104400); 10 – central plowshare (КПБ-2-0103320); 11 – roll (КПК-5-0104400-01)

Figure 2.8 – Digging block reconfiguration

After dismantling, install the rolls 9 and 11 (see Figure 2.8), cleaning scrapers 8, and central plowshare 10 on the harvester's digging block. Adjust the cleaning scrapers 8 so that the gap between the rolls and cleaning scrapers is 3±1 mm.

Install the central plowshare on the plowshare beam and secure with fixture 1 (Figure 2.9) from the set, torque for bolt connections Trq=200±10 N·m. Surfaces of plowshares A shall be in the same plane; permissible deviation not more than 3 mm.



1 – plowshare fixtures (bolts, nuts, washers); 2 – nuts; 3 – adjusting bolt (КПБ-2-0103710)

Figure 2.9 – Central plowshare installation

Adjust the central plowshare by adjusting bolts 3 (see Figure 2.9) from the right and from the left; move the adjusting bolts by nuts 2.

2.6. Operating instructions

2.6.1 Carry the harvester in the field by tractor matched with the harvester as specified in paragraph 2.3.3 transferred to transport position.

2.6.2 After the harvester is delivered to the place of work, transfer it from the transport position to operating one:

- unfasten the digging section safety ropes on the lower axle for hydraulic cylinders. The ropes shall remain hanging freely on the upper axle for hydraulic cylinders. Start the tractor engine, switch on the control panel by switch 6 (see Figure 1.15), set the switch 6 of the control panel to the position **II** and transfer the digging section to operating position by the handle of respective tractor hydraulic distributor, in which case hydraulically operated rams must be in intermediate position;
- unbolt the lock plate 2 (see Figure 2.7) and fix it in the position **II**;

- remove the safety chains, set the switch 4 (see Figure 1.15) of the control panel to the position **III** and unfold the hopper by lowering its front part with the handle of respective tractor hydraulic distributor;

- FRD1, FRD2 and FRD3 flow regulators (Appendix B, Figure B.1) are adjusted at the manufacturing plant and ensure the speed and load on the operating parts' drives to perform a stable technological process in the fields in accordance with agricultural requirements.

When it is necessary to change the speed of operating parts for increasing quality of technological process, change the position of knobs of the flow regulators.

2.6.3 Warn others by sounding the horn, engage the tractor PTO shaft and check the harvester's operation.

2.6.4 Warn others by sounding the horn, bring the engine speed to a minimum, put into gear and start moving.

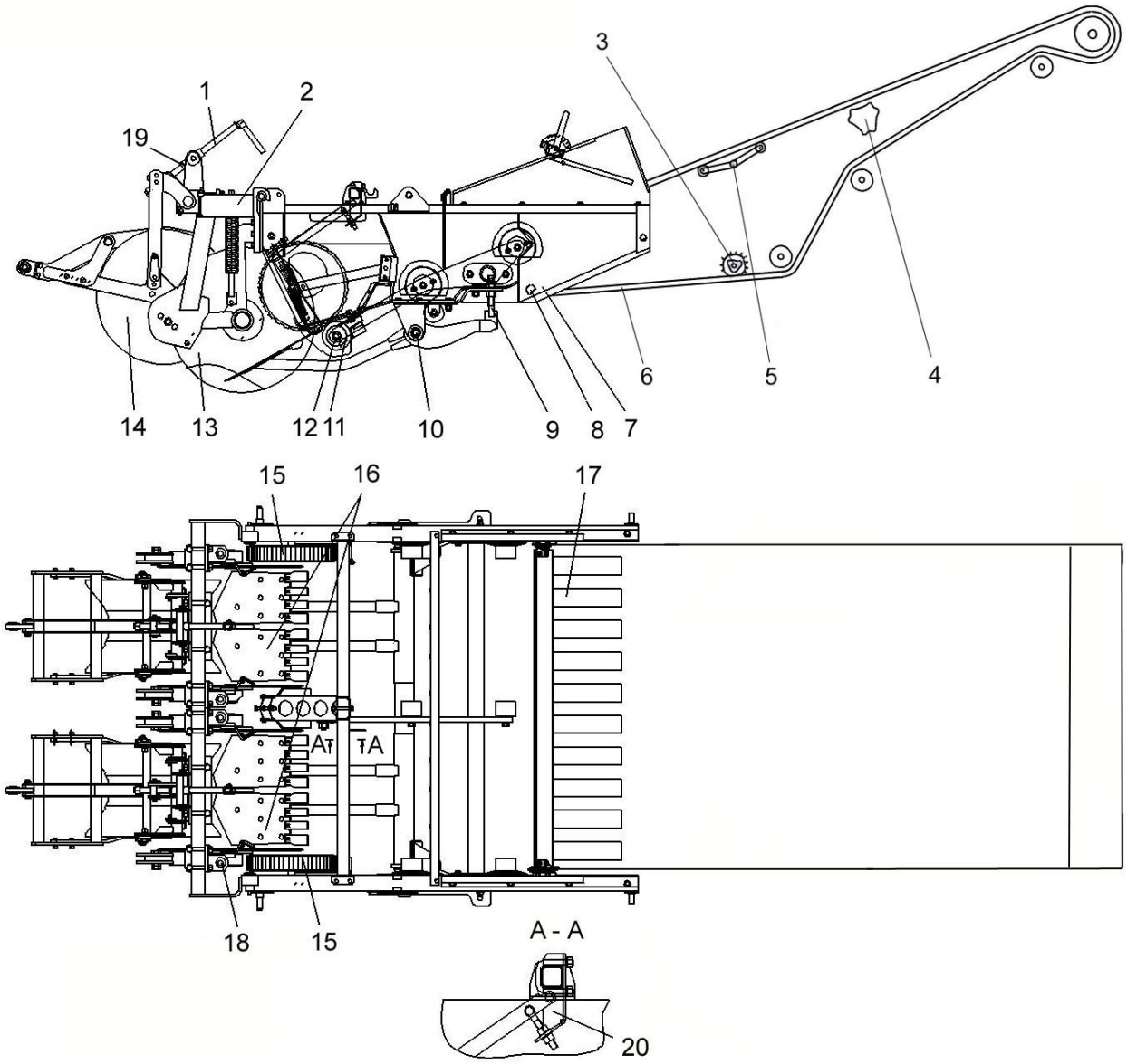
⚠ **DO NOT** reduce the tractor engine speed until the harvester’s operating parts are free from potatoes and planting mass to avoid clogging of the harvester’s operating parts.

2.6.5 Field maintenance and preparation for work

Before potato planting, the field must be cleaned from stones and foreign objects. Examine the field carefully before harvesting, especially close to roads, settlements and overhead power transmission lines. Put clearly visible markers and flags around holes, gullies, boulders and other obstacles that could cause the harvester to break down if you hit them.

2.6.6 At the work start:

- set the necessary depth of potato digging (plowshare depth) 16 (Figure 2.10) by adjusting screw 1 on the depth rollers 14; depth must be sufficient to dig out tubers without losses and damage;



1, 18 – adjusting screws; 2 – beam with rolls and discs; 3 – cleaning roll; 4 – passive shaker; 5 – active vibrator; 6 – first separating conveyor; 7, 8 – side walls; 9 – regulator; 10 – plowshare axle; 11, 12 – rollers; 13 - cutting discs; 14 – depth rollers; 15 – vine pulling wheels; 16 – plowshare; 17 – leveler; 19 – adjusting bushing; 20 -– valve

Figure 1.10 – Digging separating block and first separating conveyor

- start the tractor engine;
- set the minimum stable engine speed;
- warn others by sounding the horn and engage the tractor PTO shaft;
- rotate the harvester mechanisms without moving for 2-3 minutes;
- set the rated engine speed;

- warn others by sounding the horn and put in the first working speed of the tractor;
- select the working moving speed at which the harvester performs stable technological process.

⚠ **ATTENTION:** Activate the harvester mechanisms at the minimum stable engine speed of the tractor, smoothly, without jerking, increasing the speed to the rated value of 36.7 s^{-1} (2200 rpm)!

2.6.7 **Check the following during the work**:

- depth of potato digging (plowshare depth), quality of potato harvesting process, and, if necessary, adjust and adapt the harvester to the current conditions;
- load (pressure) applied by the moving part of the digging separating block to the ridges via depth rollers (early destruction of potato ridges, compacted layer of soil, damage of tubers on stony soils);
- separation effectiveness (presence of soil and other impurities in the potato mass entering the hopper);
- potato damage;
- losses after the harvester.

When any of the requirements of the potato harvesting process is not met, stop the harvester, shut off the tractor engine and make the necessary adjustments.

Before stopping the harvester, rotate the harvester mechanisms at the rated engine speed to clean the operating parts from plants.

During the harvester turns, always disengage the tractor PTO shaft.

When the harvester leaves the rows, turns and stops, always raise the digging separating block.

⚠ When the harvester is clogged with plants, stop the tractor, shut off the engine and clean the operating parts manually or with the help of a scraper installed on the harvester frame, subject to the necessary safety precautions.

Monitor pressure in the harvester's hydraulic system with the help of a pressure gage by connecting it to test points Т∂1 – Т∂3 (Appendix B, Figure B.1) of respective loop.

During the stop and after the work end, examine and clean the harvester.

2.6.8 Hopper unloading

Unload potatoes to the truck with the stopped harvester only.

After the harvester stops, its separating conveyors shall rotate until they are completely clear of potato clippings.

In order to avoid damaging potato tubers, the height of potato unloading to the truck shall not exceed 35 cm.

Unload the hopper as follows:

- set the switch 4 (see Figure 1.15) of the control panel to the position **IV** and raise the hopper with the handle of respective tractor hydraulic distributor for the truck to be able to approach.

There are light reflecting markers on the hopper folding part, which must be used by truck drivers when approaching the hopper.

Once the truck is under the hopper, lower the hopper to the height of the truck boards.

⚠ **DO NOT** touch the boards of the truck with the hopper;

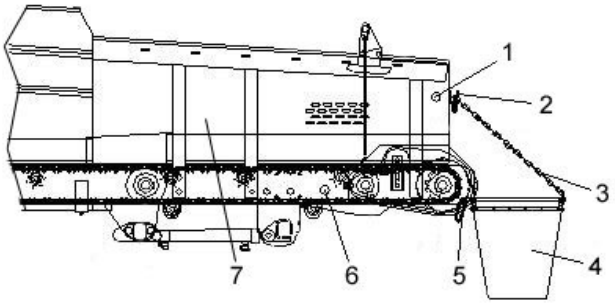
- set the switch 5 (see Figure 1.15) of the control panel to the position **II** and switch on the hopper conveyor with the handle of respective tractor hydraulic distributor;
- adjust the potato unloading height by raising / lowering the hopper. The potato unloading height shall not exceed 35 cm from the lower edge of the basket to the truck body floor or potato mass;
- when the hopper is fully unloaded, switch off the conveyor;
- after the truck departure, transfer the hopper to the horizontal working position.

2.6.9 Once the work is finished, transfer the harvester matched with the tractor to transport position on the level horizontal ground as follows:

- unload the hopper 7 (Figure 2.11);

⚠ **IT IS PROHIBITED** to transport the harvester with the hopper full of potatoes.

Traveling and maneuvers with full hopper are not allowed!



1 – boards; 2 – clinch; 3 – safety chain; 4 – basket; 5 – socket; 6 – side walls; 7 – hopper

Figure 2.11 – Hopper unloading

- extract the basket 4 from the sockets 5 on the side walls 6 of the hopper and leave it on safety chains 3 attached to the clinches 2 of the hopper boards 1.

set the switch 4 (see Figure 1.15) of the control panel to the position **IV** and lower the hopper with the handle of respective tractor hydraulic distributor; set the switch 4 to the position **III** and fold the front part of the hopper with the handle of the distributor;

set the switch 4 (see Figure 1.15) of the control panel to the position **II** and transfer the digging separating block to transport position with the handle of respective tractor hydraulic distributor, in which case hydraulically operated rams must be retracted as far as possible. Fix the digging separating block by safety ropes by placing their ends to the axles where the lugs for hydraulically operated rams are installed. Fix the ropes by splints at both sides.

2.7 Adjustments

⚠ **Make all adjustments with the harvester in operating position!**

2.7.1 Lifting depth adjustment

Set the lifting depth by changing the distance between the depth rollers 14 (Figure 2.10) and plowshares 16 with the help of adjusting screws 1. Loosen the lock nut on the screw in advance.

Rotating the adjusting screws clockwise will increase the lifting depth, while rotating them counterclockwise will decrease the lifting depth.

When adjustment is complete, tighten the lock nut.

Monitor the lifting depth by visual examination of the sifted soil behind the harvester and checking whether there are potatoes in it. Change the lifting depth, if necessary.

Where it is necessary to increase the lifting depth, remove adjusting bushings 19 from the adjusting screws 1 (1 or 2 pcs). One bushing removed will increase the lifting depth by ≈ 25 mm.

It is not recommended to dig deeper than needed, so that the harvester and the tractor are not overloaded.

2.7.2 Discs penetration adjustment

Adjust the discs penetration with raised and secured digging separating block and shut off tractor only. The working discs penetration shall match the lifting depth.

To obtain ground drive, set the working depth of the discs to 3...8 cm with the adjusting screws. Rotating the screw clockwise will increase the working depth of the discs, while rotating it counterclockwise will decrease the depth. On firm soils, there is always risk that the digging separating block will rest on the discs and the plowshare will not reach the harvesting depth. If this is the case, decrease the working depth of the discs.

2.7.3 Adjustment of pressing force of vine pulling wheels

The force of pressing vine pulling wheels to the conveyor belt must ensure the vine is caught and pulled onto the conveyor belt and, if necessary, can be adjusted by tensioning the springs with the help of a tensioning screw.

2.7.4 Plowshare angle adjustment

The working surfaces of plowshares and the first separating conveyor in the front part in front of the run-around roller must be on the same height and in the same or parallel planes. The step between the upper (working) surface of the plowshare and conveyor shall be not more than 15 mm.

Adjust the plowshare angle with the help of adjustment rods by unscrewing and screwing adjustment nuts, having previously loosened the lock nut. Tighten the lock nut after adjustment. Install plowshares at both sides.

2.7.5 First separating conveyor adjustment

Adjust the first separating conveyor belt tension with the help of tensioning device by repositioning the hole rod.

Leveler 17 adjustment (see Figure 2.10).

The force of pressing the rubber beaters in the bed leveler against the belt of the first separating conveyor is adjusted by resetting the handle on the left side wall to the holes of the arc-shaped sector. Move ahead to reduce force, back – to increase.

Active vibrator 5 adjustment (see Figure 2.10).

Oscillation frequency is adjusted by FRD3 flow regulator installed on the left side of the harvester on the front post of the hopper frame. Oscillation frequency (hydraulic motor shaft rotation speed) is set depending on the soil composition. When working on light soils, the oscillation frequency (hydraulic motor shaft rotation speed) shall be reduced, when working on firm soils, it shall be increased. In addition, the conveyor shaking amplitude can be adjusted by moving the vibrator shaft closer or farther away.

Adjust the shaking amplitude by moving the vibrator shaft through the oval holes used for attaching bearing housings to the harvester frame brackets. When the bearing housings are installed downwards - the shaking amplitude is minimum, when installed upwards - maximum.

Passive shaker 4 adjustment (see Figure 2.10).

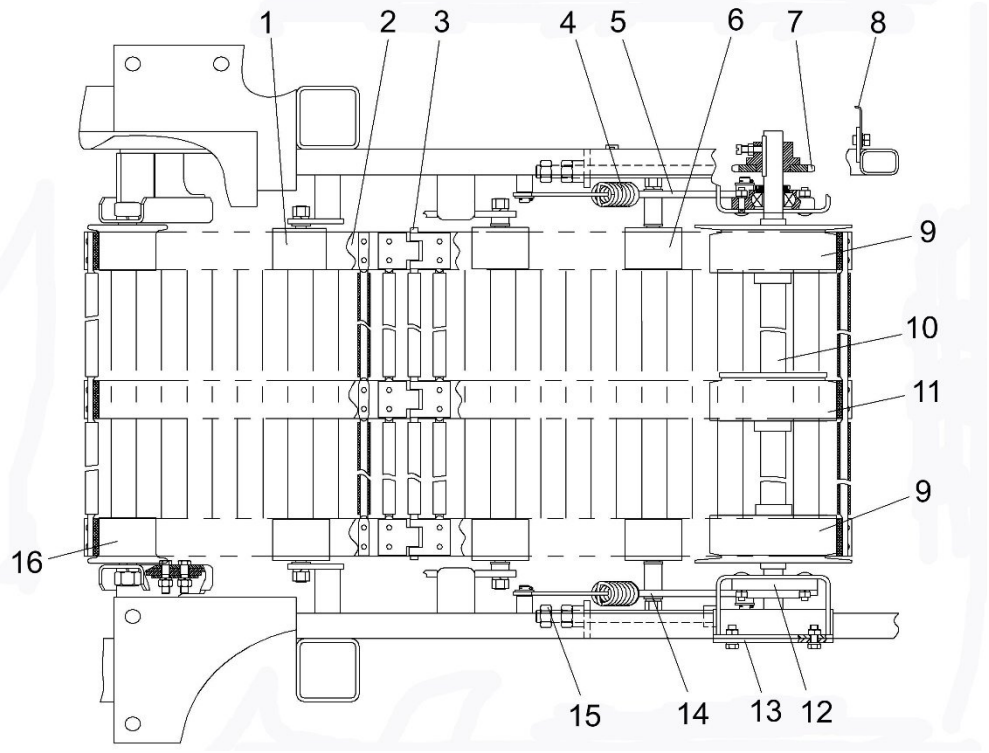
Adjust the shaker amplitude by turning the shaker frame bringing special rollers closer or farther away in relation to the conveyor belt.

Turn the shaker by resetting the handle to the holes in the bracket on the main frame of the harvester on the right side, having previously unlocked the threaded connection.

When the handle is fixed in the lower hole, the shaking amplitude is minimum, when in the upper hole – maximum.

2.7.6 Second separating conveyor adjustment

Adjust tension of the belt 2 of the second separating conveyor (Figure 2.12) by tightening or loosening pins 15, moving brackets 13 with fixed shaft 10. After adjustment is complete, tighten the fixtures.



1, 6, 16 – rollers; 2 – conveyor belt; 3 – conveyor connector; 4 – spring; 5, 14 – brackets; 7 – idler; 8 – flap; 9, 11 – steering wheel; 10 – shaft; 12 – bearing housing; 13 – connector; 15 – pin

Figure 2.12 – Second separating conveyor

2.7.7 Adjustment of gap between the rough-roll and the second separating conveyor

Adjust the gap between the rods of the rough-roll conveyor and sticks of the second separating conveyor by moving rollers 16 (see Figure 2.12). The gap shall be 15_{-5} mm.

2.7.8 Adjustment of chain tension of the main, the first and the second separating conveyor drives

The idler crowns of chain drives operating in the same loop must be in the same plane. Not more than 2 mm shift of center-to-center distance is allowed. Adjustment is done by moving idlers.

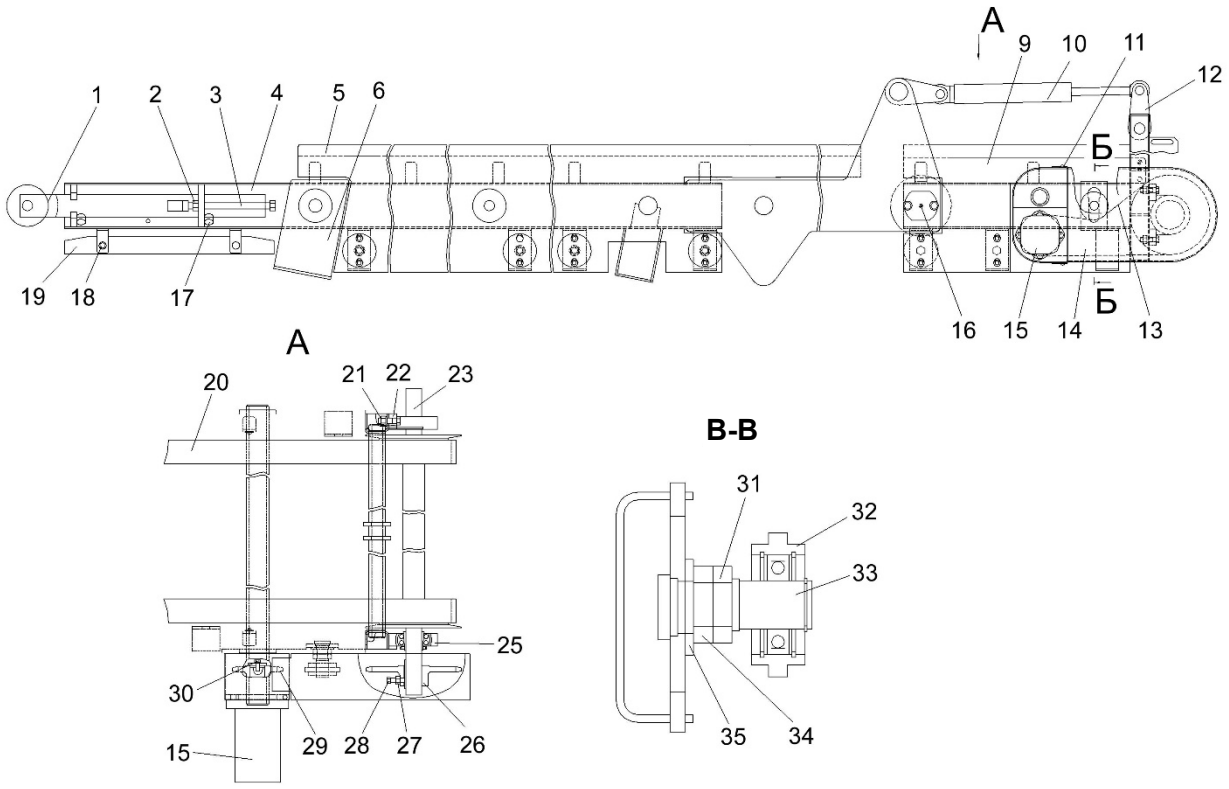
Adjust tension of the main drive chain by moving counter drive. The chain slack arrow in the middle between the drive and driven idlers at a force of 193 $\pm$ 10 N shall be 48 $\pm$ 12 mm.

Adjust tension of the first separating conveyor chain by moving bevel gearbox. The chain slack arrow in the middle between the drive and driven idlers at a force of 89 ± 10 N shall be 22 ± 5 mm.

Adjust tension of the second separating conveyor chain by moving chain idler. The chain slack arrow in the middle between the drive and driven idlers at a force of 157 ± 10 N shall be 39 ± 9 mm.

2.7.9 Hopper loading conveyor adjustment

Apply tension to the conveyor belt 20 (Figure 2.13) by tension rollers 1 with the help of tension bolts 3. The tension must be even. Skewing of the conveyor belt branches is not allowed. After the belt tensioning, the tension bolts 3 must be locked by nuts 3, and tension rollers 1 must be fixed with bolts 13.



1, 32 – tension rollers; 2, 27, 34 – nuts; 3 – tension bolt; 4, 12 – sections; 5, 9 – guard rails; 6 – bracket; 16 – axle; 10 – hydraulic cylinder; 11, 28 – screws; 13 – chain gear; 14 – shell; 15 – hydraulic motor; 17, 18, 21, 30 – bolts; 19 – damper; 20 – conveyor belt; 22 – housing; 23 – shaft; 25 – bearing; 26, 29 – idlers; 31 – lock nut; 33 – axle; 35 – ribbed plate

Figure 2.13 - Hopper loading conveyor

Apply tension to the chain gear 13 of the hopper loading conveyor with tension roll 32 on the axle 33 by moving the axle along the groove. The chain slack arrow of the driven chain branch shall be 14 ± 3 mm at a force of 160 ± 10 N. Secure the axle 33 in the selected position by ribbed plate 35, nut 34 and lock nut 31.

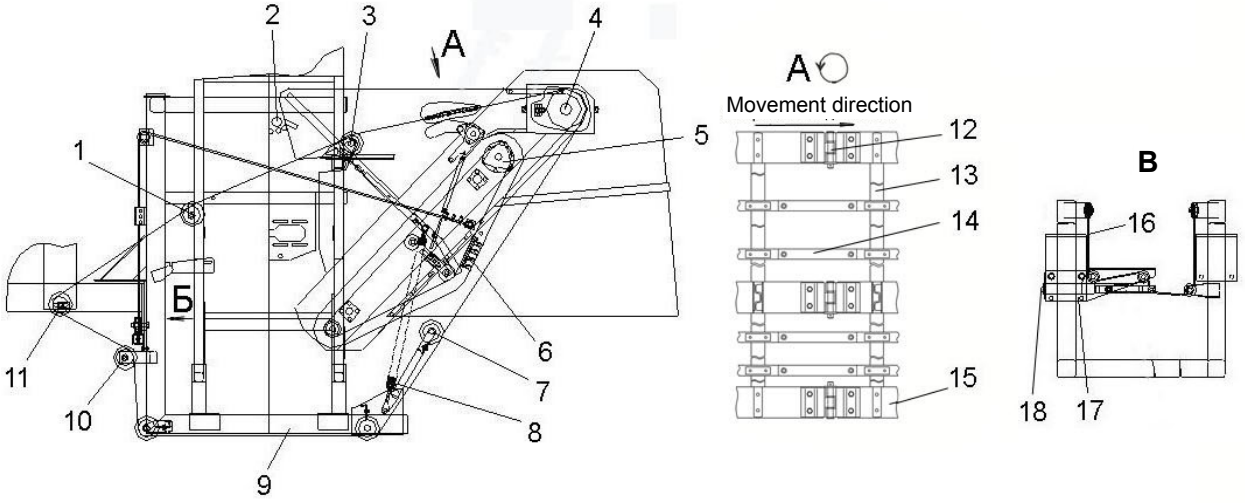
The idler 26, 29 crowns must be in the same plane. The shift of the crowns shall not exceed 2 mm. Adjust by moving the idler 26 along the shaft 23 with its further securing by screw 28 and lock nut 27.

The moving speed of the hopper loading conveyor shall correspond to the potato flow.

To increase the conveyor speed, turn the knob of the flow regulator FRD2 towards the decreasing scale, to decrease – towards the increasing scale.

2.7.10 Inclined slide adjustment

The slope of the lower inclined slide 5 (Figure 2.14) can be adjusted from 40º to 55º by the lifter 17 with the help of adjusting screw 18 and wire rope 16. Adjust the slope according to the harvesting conditions by turning the screw 18, depending on the presence of losses behind the harvester and the degree of cleaning of the potato mass entering the hopper.



1, 3, 10 – rollers; 2 – bumper plate; 4 – vine removing conveyor; 5 – inclined slide; 6 – separating conveyor; 7 – lever; 8 – spring; 9 – frame; 11 – roll; 12 – belt lock; 13 – stick; 14 – belt; 15 – conveyor belt; 16 – wire rope; 17 – lifter; 18 – adjusting screw

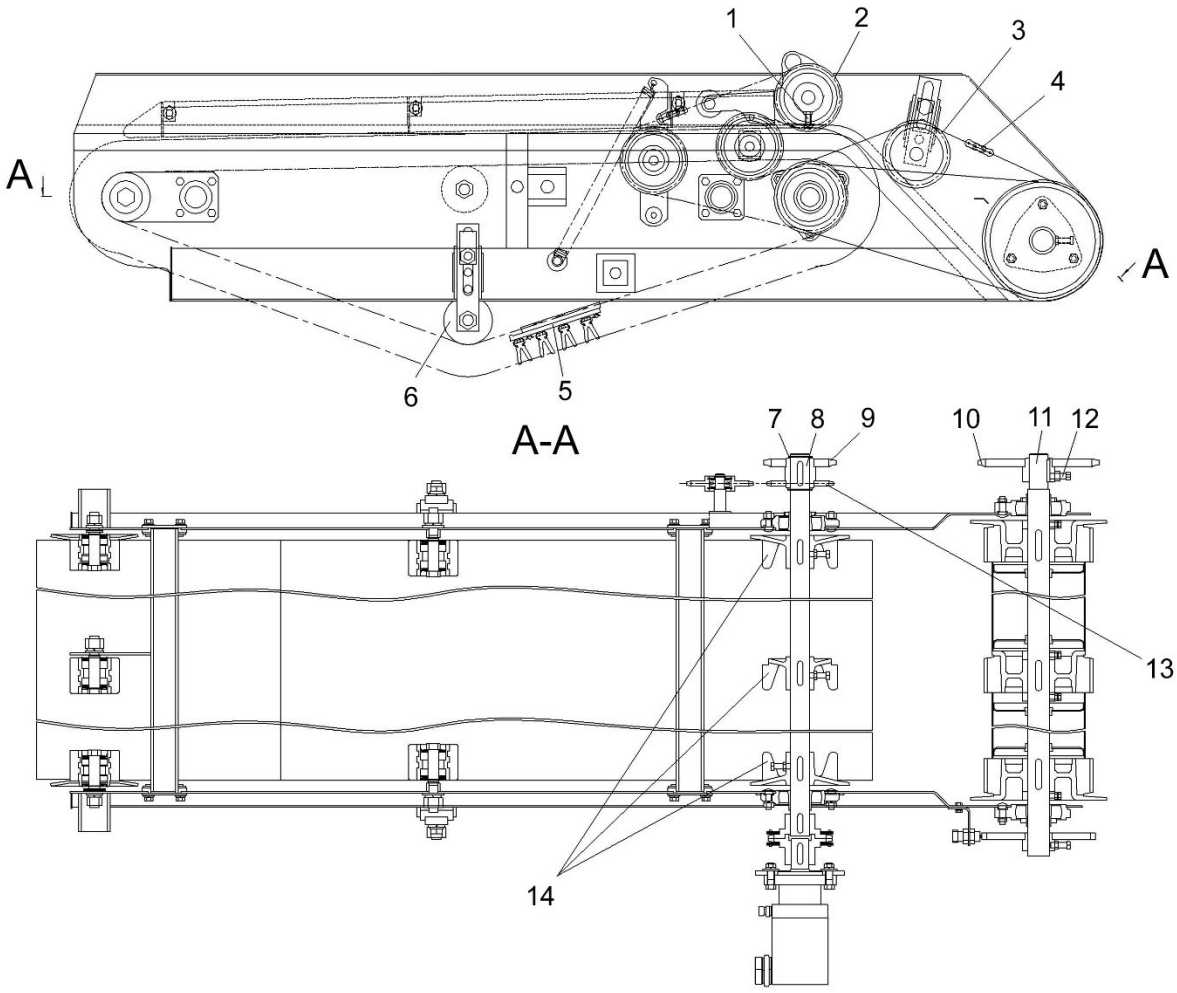
Figure 2.14 – Inclined slide adjustment

The separating conveyor 5 (Figure 2.15) of the inclined slide shall not slip on the drive wheels 14 of the shaft 8. Adjust tension of the separating conveyor by moving tensioning device 6.

Apply tension to the chain 4 of the drive shaft 11 by the chain idler 3. The slack arrow of the driven chain branch shall be 12…20 mm at a force from 150 to 170 N.

Crowns of the idlers 2, 13 must be in the same plane. Mutual shift of the crowns shall not exceed 1.2 mm. Adjust by moving the idler 13 by rings 7 and idler 2 along the cotter key, having loosened the screw 1.

Crowns of the idlers 9, 10 must be in the same plane. Mutual shift of the crowns shall not exceed 1.6 mm. Adjust by moving the idler 10 along the cotter key, having loosened the screw 12.



1, 12 – screws; 2, 3 – chain idlers; 4 – chain; 5 – separating conveyor; 6 – tensioning device; 7 – rings; 8, 11 – shafts; 9, 10, 13 – idlers; 14 – drive wheels

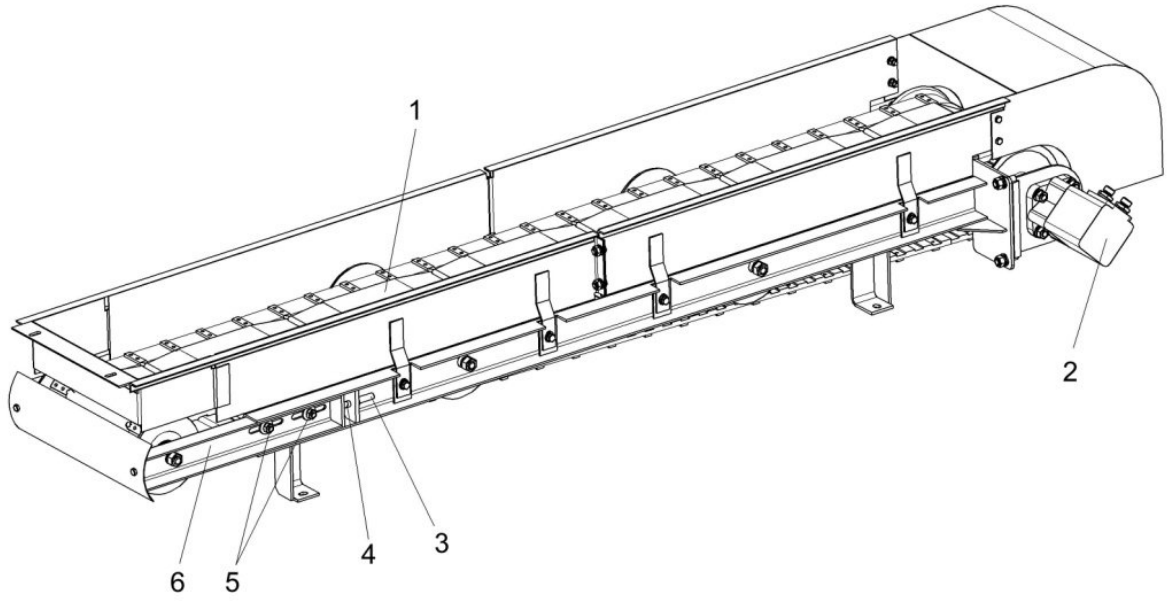
Figure 2.15 - Inclined slide

2.7.11 Rough-roll conveyor adjustment

Apply tension to the rough-roll conveyor 4 belt (see Figure 2.14) by lever 7.

2.7.12 Impurity conveyor adjustment

Adjust the tension of the impurity conveyor belt 1 (Figure 2.16) by the stretcher 6 with the help of bolts 3, having previously loosened the bolts 5. After tensioning, lock the bolts 3 with lock nut 4



1 – conveyor belt; 2 – hydraulic motor; 3, 5 – bolts; 4 – lock nut; 6 - stretcher

Figure 2.16 - Impurity conveyor

The conveyor belt tensioning is deemed sufficient when its lower branch slacks by 20±5 mm.

2.7.13 Running swivel wheels adjustment

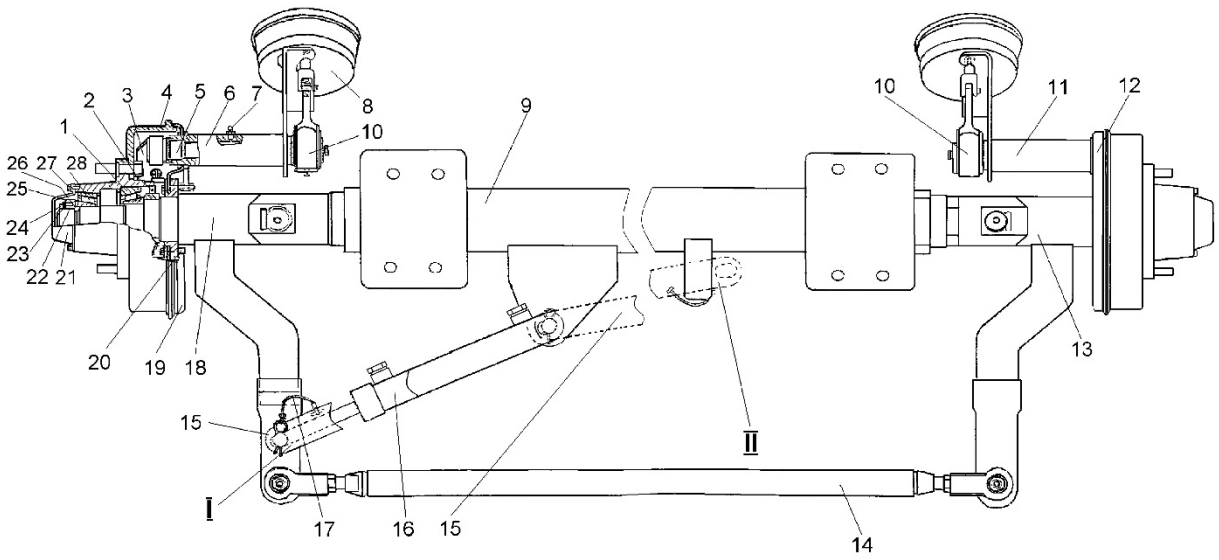
Wheel nuts should be tightened evenly crosswise with a special wrench. The nuts torque is from 274.58…313.81 N·m.

2.7.13.1 Adjustment and lubrication of wheel bearings

- ace the harvester on a horizontal platform, apply the parking brake and place wheel blocks under the wheels;

- jack up the axle with the wheel whose bearing is to be adjusted, place supports under the axle, remove the jack;

- remove the hub cover of the wheel (Figure 2.17), having unscrewed bolts 27;



1, 28 – bearings; 2 – wheel hub gland sealing; 3 – break shoe; 4 – hub with brake drum; 5 – cam; 6, 11 – brackets; 7 – oil cup; 8 – brake chamber; 9 – wheel axle; 10 – adjusting lever; 12, 19 – back plates; 13, 18 – pivots; 14 – steering rod; 15 – lock plate; 16 – hydraulic cylinder; 17 – splint; 20 – brake fixing bolt; 21 – wheel hub cap; 22 – washer nut; 23 – lock washer; 24 – nut; 25 – bearing nut lock washer; 26 – stud; 27 – bolt with washer

Figure 2.17 – Running swivel wheels axle

- bend the edges of the lock washer 23, unscrew the nut 24, remove the bearing nut lock washer 25 and washer nut 22, remove the wheel with the hub;

- flush the bearings and inner hub cavity, inspect them, make sure they are not damaged;

- put Litol-24 grease into the bearings of wheel hubs to 1/3 of the free volume (250 g) per each hub.

Apply a thin layer of grease to the working surface of the rubber glands of wheel hubs 2 before reinstallation;

- install the wheels on the pivots 13, 18;

- tighten the washer nut 22 by turning the wheel by hand until it turns tightly.

Turning the wheel is necessary to ensure that the rollers are correctly positioned in the bearing raceways. Tighten by one hand force, smoothly, without jerking. Loosen the washer nut 22 by 1/6-1/8 turn. Align the stud 26 of the bearing nut lock washer 25 by tightening the nut 24. Check the rotation of the wheel hub by turning it in both directions. After adjustment, bend the edge of washer 23 onto one of the faces of nut 24;

- check the adjustment of bearings after the nut tightening. When properly adjusted, the hub should rotate freely, with no perceptible axial runout or play;
- fill the wheel hub cap 21 with grease and reinstall it, tighten bolts 27;
- check the quality of adjustment by observing the heating of the wheel hubs while driving. Slight heating of the hubs is not dangerous.

If excessive heat builds up, loosen the bearing nut to 1/2 of edge, for which repeat the steps in the above sequence. After 10-15 hours of operation, retighten the nut to 1/2 of edge again.

2.7.13.2 Brake adjustment

If the stroke of the brake chamber rods increases to 40 mm after adjusting the bearings, adjust the wheel brakes.

Normal stroke of brake rods is 20...30 mm with permissible difference between the strokes of right and left brake chambers not more than 5 mm.

Make adjustment in the following order:

- immobilize the harvester with the parking brake. Put wheel blocks under its wheels and jack up the axle and wheel;
- make sure there are no gaps in the hub bearings. Adjust the hub bearings, if necessary;
- release the parking brake;
- turn the worm axle of the adjusting lever 10 of the expander cam clockwise until the drum engages when the wheel rotates;
- turn the worm axle backwards by 120...180º, which will ensure the brake chamber rod stroke within 20...30 mm.

In the adjusted brakes the gap between the pads of brake shoes and the drum should be 0.2...0.6 mm, which corresponds to the stroke of the brake chamber rods within 20...30 mm. After adjustment, check the stroke of the rods by supplying compressed air at a pressure of 0.72±0.1 MPa to the pneumatic chambers. Make additional adjustment, if necessary;

- fix the adjusting lever 10 screw by the lock plate after the brake adjustment and check.

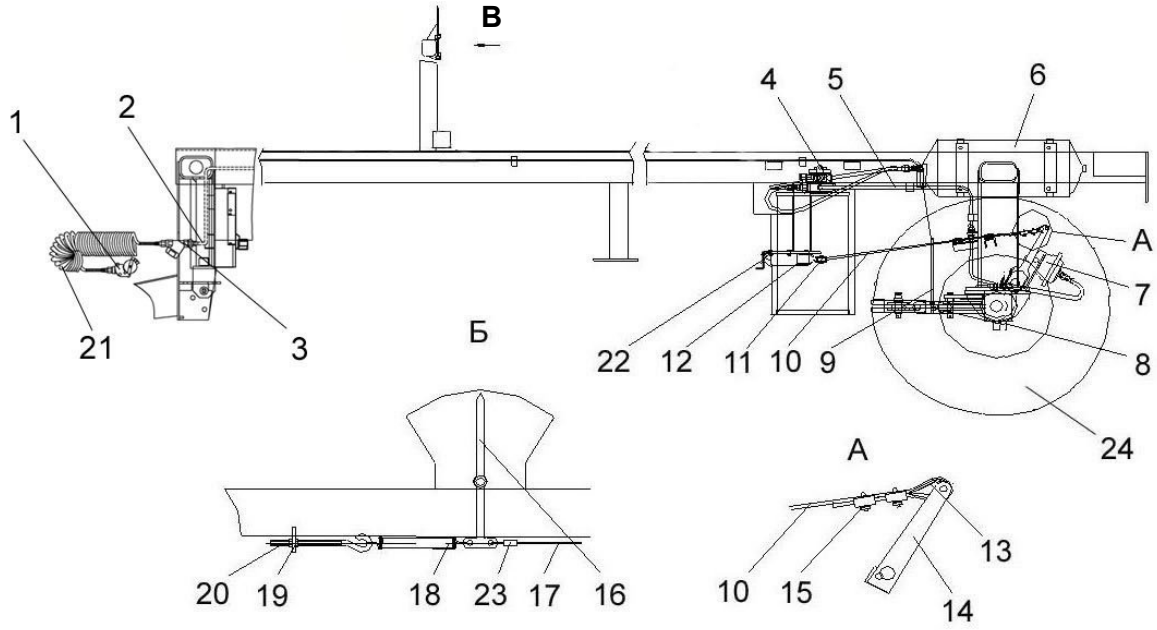
After checking the brake adjustment, unbrake the wheels. To do this, extend the brake release valve stem located on the air distribution valve by pulling the handle towards yourself.

Maintenance of wheel brakes consists in adjustment of clearances between shoes and drums, lubrication in accordance with Table 3.2, as well as periodic cleaning of brakes and checking of fastening.

2.7.13.3 Parking brake drive adjustment

Adjust the parking brake drive after the brake adjustment as follows:

- extend tension roller 11 (Figure 2.18) by turning the lever with knob 22 counterclockwise until it stops;



1 – connecting head; 2 – pneumatic tube; 3 – line filter; 4 – air distribution valve; 5 – pipeline; 6 – receiver; 7 – brake chamber; 8, 19 – nuts; 9 – pin; 10 – hand brake cable; 11 – tension roller; 12 – hand brake; 13 – rope eye; 14 – lever; 15 – pad; 16 – wheel turn indicator arrow; 17 – wire rope; 18 – spring; 20 – tension bolt; 21 – spiral pneumatic tube; 22 – handle; 23 – clip; 24 – steering wheel

Figure 2.18 – Brake drive and wheel turn indicator installation

- loosen clips, tighten brake cable 10 and tighten clips, while adjusting levers 14 must not turn under cable tension;

Check the parking brake drive work. The drive is correctly adjusted if turning the drive handle 22 clockwise to a force not exceeding 400 N causes the wheels to brake, and the drive screw has a travel range.

2.7.13.4 Wheel turn indicator adjustment

The arrow of wheel turn indicator 16 (Figure 2.18) should be in vertical position when the harvester is moving straight ahead. If the arrow is deflected, adjust it to the vertical position using the tension bolt 20 and nuts 19 by clip 23.

2.7.14 Pneumatic system leak test

Check the leak tightness of the pneumatic system as follows:

- connect the pressure gage to the control output valve on the receiver 6 (see Figure 2.18), and the connection head 1 – to the compressed air source, and bring the pressure in the air cylinder to 0.72 MPa. Air leakage in connections is not allowed;

- disconnect the harvester line from the compressed air source (close the tractor's shut-off cock) without connecting it to the atmosphere and thereby stopping the receiver filling, thus the pressure drop in the pneumatic system should not exceed 0.05 MPa for at least 30 min with the brake system controls in free position or more than 0.01 MPa for at least 3 min with fully braked position. If there is a large drop in pressure, find the leaky connection, repair the leak and repeat the test;

- connect the pneumatic system line with the atmosphere (disconnect from the tractor). The harvester wheels should be braked: the stroke of brake chamber rods should be 30±5 mm, the pressure drop in brake chambers after the established braking mode should not exceed 0.05 MPa for 15 min, excluding the pressure drop when filling the brake chambers;

- extend the stem of the brake release valve located on the air distributor by pulling the handle towards yourself, and the wheels should brake.

2.7.15 Adjusting the pressure of the depth rollers on the ridges

In order to reduce the pressure of the depth (support) rollers on the ridges, the under-digging section must be raised with the help of hydraulic cylinders. This fills the pneumatic hydraulic accumulator with oil and raises the pressure in the lift cylinder line, which is visually reflected on the pressure gage. When the desired unloading has been achieved, turn the handle of the hydraulic distributor of the tractor TR1 and the switch of the remote control panel to the neutral position, then part of the weight of the digging section is transferred to the main frame of the harvester. At the same time, the digging section can be moved further, because the pneumatic accumulator in the hydraulic system acts as a spring and allows the stroke of the lifting cylinder rod to be changed.

Effective minimum pressure in the pneumatic hydraulic accumulator is about:

- for reducing the load by 1/3 – 23 kg/cm;
- for reducing the load by 1/2 – 33 kg/cm;
- for reducing the load by 2/3 – 44 kg/cm.

It is not recommended to reduce the load by more than 2/3 during operation, as the digging section may lift up and damage the potatoes with the plowshares.

After adjusting the ridge pressure, the digging depth must be checked.

3 Technical maintenance

3.1 Types and periodicity of technical maintenance

3.1.1 Technical maintenance consists in shift and periodic inspection, cleaning, lubrication and adjustment of the harvester. All MTM and TM-1 maintenance operations shall be carried out regularly, at specific time intervals, depending on the number of hours worked by the harvester in accordance with Table 3.1.

It is allowed to deviate from the established TM periodicity by 10% depending on the harvester operation conditions.

In all cases of failure of fastening or adjustment of mechanisms, occurrence of noise, knocking, eliminate deficiencies without waiting for the next TM.

Table 3.1 - Types and periodicity of technical maintenance

Types of technical maintenance	**Periodicity, in hours**
Running-in technical maintenance	Before operation start
Monthly technical maintenance (MTM)	10
Technical maintenance No.1 (TM-1)	60
Technical maintenance before start of the operation season (TM-O)	1 per season (at the beginning of the season)

3.2 List of operations for different types of technical maintenance

3.2.1 Running-in technical maintenance

When preparing for running-in

- clean the harvester components from dust, dirt and preservation grease;
- check and, if necessary, tighten the outer threaded connections of the harvester, paying attention to the wheel hubs;
- check and, if necessary, lubricate the harvester components in accordance withe Table 3.2 and lubrication diagram (Figure 3.1);
- check gearboxes for oil leaking and, if necessary, add oil;
- check that the harvester is matched with tractor properly;
- check and, if necessary, adjust tire pressure in the running swivel wheels (0.37 MPa);
- check (after the first 10 hours) the screw and nut connection of the locks on the conveyor belts for tight fit and tighten, if necessary, then lock the nut against unscrewing.

During running-in (within 30 hours), perform monthly technical maintenance (MTM).

Upon running-in completion, perform Technical maintenance No.1 (TM-1).

3.2.2 Monthly technical maintenance (MTM)

- clean the harvester components from dust, dirt and remains of pant mass;
- check, and if necessary, tighten the outer threaded connections, paying attention to the wheel hubs;

- check the harvester hydraulic system and gearboxes for oil leaking and, if necessary, add oil;
- check that the harvester is matched with tractor properly;
- check and, if necessary, adjust tire pressure in the running swivel wheels (0.37 MPa);
- lubricate the harvester components in accordance with the Table 3.2 and lubrication diagram (Figure 3.1);

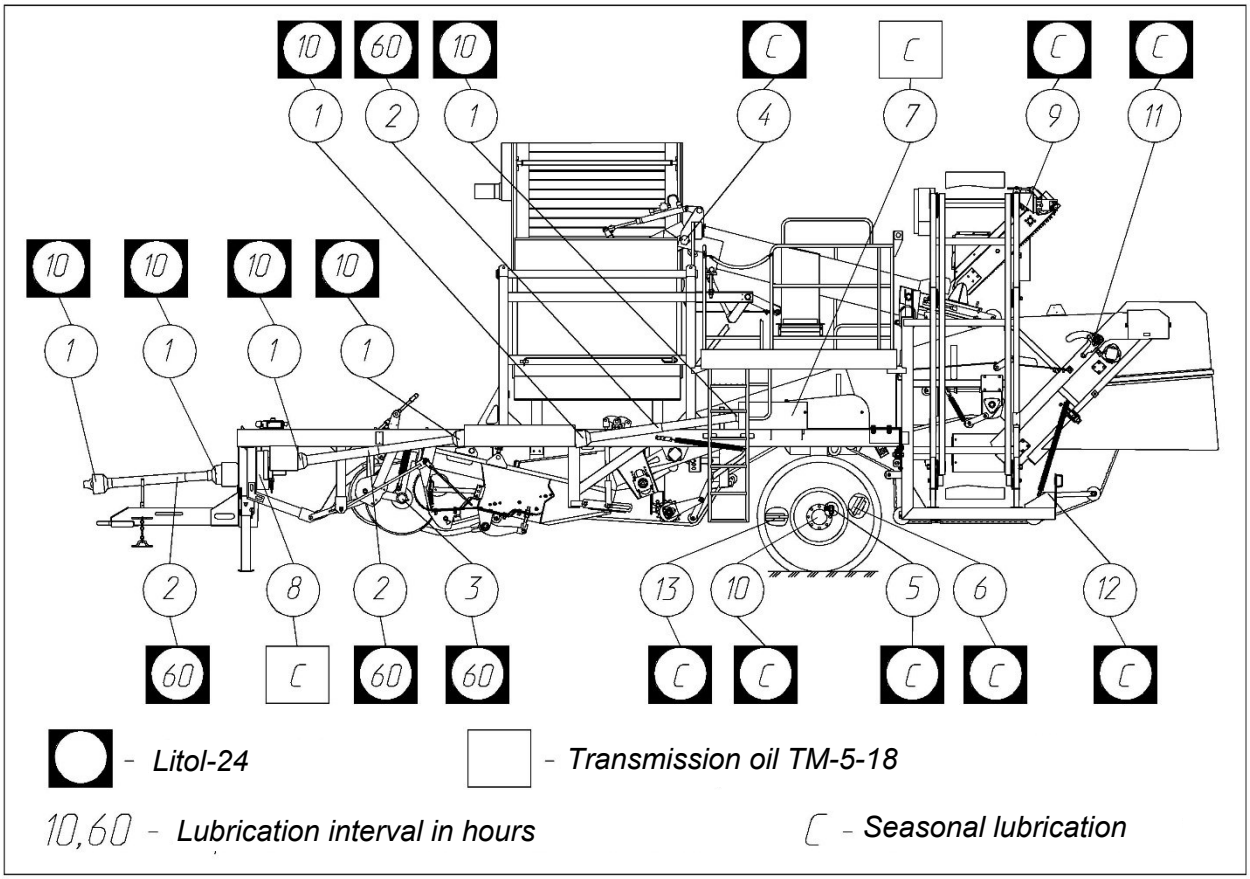


Figure 3.1 – Harvester lubrication diagram

- check the condition of connection elements of all conveyor belts of the harvester for wear, and replace them if necessary;

⚠ **ATTENTION:** Conveyors connection elements (locks and connectors) are subject to natural wear and tear during operation!

- drain condensate from the pneumatic system receiver.

3.2.3 Technical maintenance No.1 (TM-1)

- clean the harvester components from dust, dirt and remains of pant mass;
- check and, if necessary, tighten the outer threaded connections, paying attention to the wheel hubs and connecting locks on the belts of separating conveyors;
- clean the outer surface of air filters (breathers) located in the upper part of the oil tank;
- check the harvester hydraulic system and gearboxes for oil leaking and, if necessary, add oil;
- check that the harvester is matched with tractor properly;
- check and, if necessary, adjust tire pressure in the running swivel wheels (0.37 MPa);
- check and, if necessary, adjust tension of chain gears, conveyor belts, axial play of bearings and breaks of running swivel wheels;
- lubricate the harvester components in accordance with the Table 3.2 and lubrication diagram (Figure 3.1);
- check the state of the harvester components and parts subject to periodical replacement and, if necessary, replace them. The list of components and parts subject to periodic replacement is presented in Table 8.1.

3.3 Harvester lubrication

Lubricate the harvester components in accordance with the Table 3.2 and lubrication diagram (Figure 3.1);

Table 3.2 – Harvester lubrication

No. of position on lubrication diagram	Names of lubrication points	Name and make of lubricant for operation and storage	Quantity of lubrication points
Lubrication periodicity – 10 hours			
1	Swivels and bearings of propeller shaft protective covers	Litol-24	6
Lubrication periodicity – 60 hours			
2	Telescopic and slip joint of propeller shafts	Litol-24	3
3	Cutting disc bearing housing	Litol-24	4
Lubrication periodicity – one time per season (at the beginning of the season)			
4	Hopper loading conveyor supports	Litol-24	2
5	Pivot of running swivel wheels	Litol-24	2
6	Axle of brake chambers	Litol-24	2
7	Bevel gearbox	Oil TM-5-18	1
8	Parallel-shaft gearbox	Oil TM-5-18	1
9	Connection bushing of the lifting conveyor hydraulic motor	Litol-24	1
10	Bearings of the hub of running swivel wheels	Litol-24	2
11	Revolving roller bearing housing	Litol-24	2
12	Conveyor belt stretcher lever bushing	Litol-24	2
13	Steering rod pivots of the steering wheels	Litol-24	2

3.4 Instructions for technical maintenance and use of spare parts from SPTA set

3.4.1 Harvester hydraulic system technical maintenance

3.4.1.1 Every day before the hydraulic drive starting, it is required to:
- visually examine the hydraulic drive elements;
- tighten, if necessary, threaded connections of oil pipelines;
- check the oil level in the tank and, if necessary, add oil.

3.4.1.2 While working, it is necessary to control the working fluid heating in the hydraulic system by temperature gage integrated into the oil indicator in the oil tank (max allowable temperature ≈ 70 ºС);

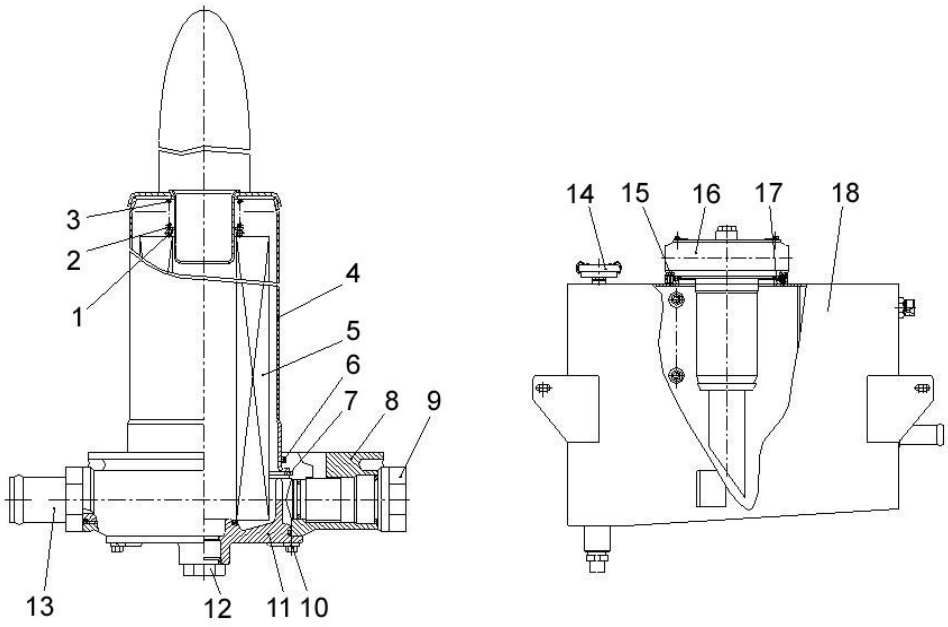
3.4.1.3 Change oil in the oil tank as follows:
- first change of the working fluid in 480 hours, but not later than in two seasons;
- second change – in 960 hours, but not later than in two following seasons, with oil adding, if necessary, during operation.

3.4.1.4 Change the filtering elements of the drain filter with the following intervals: first – in 60 hours, second – in 240 hours and further not later than in 240 hours of work.

To change the filtering element 5 (Figure 3.2), remove filter 16 from the oil tank 18, having unscrewed the bolts 15 and removed the ring 17.

Change procedure:
- unscrew the drain plug 12 and drain oil from the filter body;
- unscrew bolts 10 and remove the cover 11 together with the filtering element 5;
- change the filtering element by a new one, having previously removed the label;
- assemble the filter in reversed order.

When changing the filtering element, avoid the ingress of foreign objects, moisture and dirt to the oil tank.



1, 6, 7, 17 – rings; 2 – washer; 3 – spring; 4 – cup; 5 – filtering element; 8 – body; 9 – signaling valve; 10, 15 – bolts; 11 – cover; 12 – drain plug; 13 – nozzle; 14 – breather; 16 – filter; 18 – oil tank

Figure 3.3 – Drain filter Filter installation

3.4.2 Oil change in parallel-shaft gearbox

The parallel-shaft gearbox is filled with ТАП-15В or ТЭп-15 oil via the breather hole to the lower edge of the level plug hole located at the bottom left of the drive idler.

3.4.3 Oil change in bevel gearbox

The bevel gearbox is filled with ТАП-15В or ТЭп-15 oil via the breather hole to the lower edge of the level plug hole.

3.4.4 Replacement of rods and sticks in separating conveyors

- cut off the rivets of replaceable rods or sticks. Knock out the cut rivets;
- install spare rod or stick, plate and staggered rivet, and conveyor belt on the stand, and put on the tube, if necessary;
- rivet the rod or stick.

3.4.5 Replacement of sticks in rough-roll conveyor

- cut off the rivets of rough-roll conveyor Knock out the cut rivets;
- unbend the clip whiskers of the middle conveyor belt fastener, cut off the rivets of the clip fastener. Knock out the cut rivets;
- remove the old stick with fastening plates;
- install the spare stick, plate, clip, bracket and staggered rivet, and conveyor belt on the stand;
- rivet the stick;
- rivet the clip and bend its whiskers.

3.4.6 Replacement of separating conveyors connector

- release tension of the conveyor belt;
- remove the old connector and install a new one.

3.4.7 Replacement of separating conveyors lock

- cut off the nuts securing the lock hinges. Knock out the screws;
- install spare hinge on the stand, insert the conveyor belt into it, a plate and four screws with nuts;
- tighten the nuts and unrivet the threaded part of the screw above the nut.

4 Running repairs

4.1 Safety measures

Repair and maintenance work is performed only by trained service specialists.

⚠ All work related to repair, adjustment, maintenance and lubrication of the harvester must be carried out with the tractor engine turned off, the operating parts completely stopped, the key removed from the ignition switch, the hopper lowered, the folding part of the hopper secured and the digging section secured.

Tools and equipment for performing technical maintenance must be in good working order and ensure the safety of the work.

⚠ **IT IS PROHIBITED** to climb into the harvester hopper or perform any work on replacing or repairing hydraulic system components while the tractor engine is running.

⚠ **IT IS PROHIBITED** to carry out repair and maintenance work when the hopper is in the raised position.

⚠ Repairs to hydraulic systems should only be performed in a specialized workshop. Before disassembling hydraulic system components, thoroughly clean the intended disassembly area of dirt, dust, and other contaminants. For the fastest and most effective way to remove contaminants from the external surfaces of hydraulic connections, use the available pneumatic system of a harvester or another compressed air source, followed by wiping with a clean rag.

Hydraulic hoses should be regularly inspected, and damaged or worn hoses should be replaced with new ones. Hoses must meet the required technical requirements for the harvester.

Do not allow contaminants to enter the internal cavities of the hydraulic system, as this will cause jamming of the hydraulic distributor spools, failure of hydraulic pumps, hydraulic motors and other system elements.

Keep the mating surfaces of quick-release half-couplings perfectly clean. Connecting half-couplings with contaminated mating surfaces will result in hydraulic equipment failure.

⚠ It is prohibited to disconnect the high-pressure hoses of the hydraulic system on the folding part of the hopper without first securing it from overturning, on the hydraulic cylinders of the hopper lifting when the hopper is raised, and on the hydraulic cylinders of the digging section without first securing it in the transport position.

When repairing hydraulics, the pressure in the harvester’s hydraulic system must be removed (the hopper must be lowered, the folding part of the hopper and the digging section must be fixed).

Before starting welding or other work using open flame, it is necessary to thoroughly clean the harvester and the area around it from plant debris.

Do not leave tools or other objects on the harvester after repairs or adjustments. Getting them into the operating parts could cause an accident.

4.2 Possible faults and troubleshooting methods

The main possible faults and troubleshooting methods are given in Table 4.1.

Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
The harvester as a whole		
The harvester drive propeller shaft has increased rotation dynamics (strong vibration)	The end yokes are not located in the same plane	Install the end yokes in the same plane: 1 Check the position of the end yokes; 2 If the end yokes are not in the same plane, it is necessary: - disconnect the propeller shaft at the telescopic joint; - turn one of the swivels until the end yokes are aligned in the same plane; - connect the propeller shaft in a telescopic joint
Increased noise during operation of chain circuits	The tension of the drive chains is loose	Adjust the chain tension in accordance with paragraphs 2.7.8 of this operation manual.
	Wear of drive chains	Replace the drive chains with new ones. To do this, first loosen the chain tension using the tensioning devices, then remove the chain and install a new one in its place. After installing the chain, adjust its tension (see above).
Presence of damaged potato tubers. Large losses of potato tubers in the soil	Insufficient lifting depth of potato tubers	Set the required lifting depth according to paragraph 2.7.1

Continuation of Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
Increased potato tuber losses	Bending or breaking of the sticks of separating conveyors	Straighten or replace damaged sticks with new ones in accordance with paragraph 3.4.4
	Bending or breaking of the sticks of a rough-roll conveyor	Straighten or replace damaged sticks with new ones in accordance with paragraph 3.4.6
Digging separating block		
Accumulation of tops and weeds between the plowshares and cutting discs	Uneven supply of potato tuber mass to the separating conveyor	Adjust the cutting depth of the soil layer with discs in accordance with paragraph 2.7.2
Insufficient soil separation on the conveyor	The presence of a large amount of soil at the end of the conveyor	Adjust the position of the active vibrator and the passive shaker in accordance with paragraph 2.7.5
Insufficient tension of the springs of the vine pulling wheels	Accumulation of tops and weeds between the side walls and vine pulling wheels	Adjust the tension of the wheel springs according to paragraph 2.7.3
Second separating conveyor		
The conveyor stops or slips	The conveyor band tension is loose	Adjust the conveyor belt tension according to paragraph 2.7.6
Rough-roll conveyor		
The conveyor stops and slips	The conveyor belt tension is loose	Adjust the conveyor belt tension according to paragraph 2.7.11
Removing potato tubers along with tops and weeds	Large gap between the conveyor belt of the inclined slide and the bumper rollers	Set the minimum clearance by moving the bolt

Continuation of Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
Inclined slides		
Removal of potato tubers by slide conveyors	Insufficient slope angle of the slides	Set the required slope angle using the adjustment mechanism in accordance with paragraph 2.7.10
Potato tuber losses	Fracture of the slide separator strips	Replace the separator rods with new ones in accordance with paragraph 3.4.4
Lifting and accompanying conveyors		
The lifting and accompanying conveyors stop or slip	Weak tension of conveyor belts	Tighten the conveyor belts
Hopper loading conveyor		
Conveyor belt stop	Misalignment of tension rollers	Set the rollers in one plane using tension bolt 3 (see Figure 1.10)
Hopper		
The hopper conveyor is not working	There is no oil in the cavity of the conveyor drive hydraulic motor	On the harvester control panel, transfer switch 5 (see Figure 1.15) twice in a row to position II in accordance with paragraph 1.3.15

Continuation of Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
Hydraulic system		
Oil and foam splashing out through the oil tank breather, loud noise in the hydraulic pump	Air leak in the hydraulic system	Tighten the connections on the hydraulic pump suction lines. Check the quality of the O-rings on the suction flanges; replace them if damaged.
There is no rotation of the shafts of the hydraulic motors of the operating parts	Not enough oil in the system. The oil level in the tank is below the permissible level.	Add oil to the tank up to the upper scale of the oil level indicator.
	Oil leakage in hydraulic system connections	Tighten the hydraulic system connections where oil is leaking. Replace the hydraulic glands if necessary.
	Incorrect setting of the flow regulator divider	Set the flow regulator divider handle to the position required to ensure rotation of the hydraulic motors
	The electrical equipment for switching on the electrically controlled valves is faulty	Use a tester or a test lamp to check for voltage at the electrically controlled valve plug. If there is no voltage, check the wires for breaks and repair them if necessary.
	Hydraulic pump is faulty	Replace the hydraulic pump

Continuation of Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
Violation of the technological process when clogging the operating parts		If the harvester is clogged (the hydraulic motor-driven operating parts are stopped) and the tractor's power take-off shaft is engaged at maximum speed, check the hydraulic system pressure using a pressure gauge and the pressure gauge connection hose from the harvester spare parts kit. Connect the pressure gauge to diagnostic points Тд2 or Тд3 of the corresponding circuit being clogged (Appendix B, Figure B.1).
	Incorrect setting of the flow regulator divider	Set the flow regulator divider handle to the position required to ensure rotation of the hydraulic motors
	Jamming of mechanical elements driven by hydraulic motors	Check the idle pressure, which should be no more than: for НШ-20 – 2 MPa; for НШ 32 – 5 MPa when loading the hopper, for НШ-32 – 7 MPa when unloading from the hopper with the simultaneous execution of the technical process. At high pressure values, eliminate mechanical jamming of the operating parts driven by hydraulic motors

Continuation of Table 4.1

Faults, external manifestation	Possible causes	Troubleshooting method, necessary adjustments
There is no movement of the hydraulically operated rams		Check the hydraulic system pressure using a pressure gauge and the pressure gauge connection hose. Connect the pressure gauge to diagnostic point T∂1 (Appendix B, Figure B.1).
	The tractor's electrical equipment is faulty	If the pressure gauge shows 18 MPa, check with a tester or a test lamp for the presence of voltage at the plug connector of the corresponding hydraulic distributor. If there is no voltage, check the connected wires for an open circuit and, if necessary, restore contact.
	The hydraulic unit is faulty	If the pressure gauge shows 18 MPa, remove the control hydraulic distributor. Remove the solenoid. Remove all components from the hydraulic distributor housing. Given the asymmetrical design of the valve spool, note its location within the housing during disassembly. Rinse all components in clean diesel fuel. Lubricate with hydraulic fluid and reassemble in reverse order. Before installing the solenoids, check the ease of movement of the spool. Check the spool movement force in the assembled hydraulic distributor. When pressing the control button on the hydraulic distributor, the spool should move with a force of no more than 40 N.

End of Table 4.1

Faults, external manifestation	Possible reasons	Troubleshooting method, necessary adjustments
	The tractor's hydraulic pump is faulty	If the pressure gauge reading is less than 18 MPa and is insufficient for the hydraulic cylinders to move, check the setting of the tractor hydraulic system relief valve or replace the tractor hydraulic pump.
Electrical equipment		
The lights in both rear lights of the harvester do not light at the same time.	The harvester light harness plug is not connected to the tractor's light socket.	Open the socket cover and connect the plug of the lighting equipment.
The light in one or more sections of the rear lights does not work	Burnout of incandescent lamp filaments	Remove the lamp cover and replace the corresponding bulbs.
The “CONVEYOR” LED is constantly on when the harvester is operating.	Open circuit in the connection of the PRP-1M sensor or short circuit in the circuits	Disconnect the sensor pads from the harness. Using a tester, check the DC resistance of the sensor winding. The resistance should be no less than 1100 ohms and no more than 1350 ohms. Insulation resistance between the housing and terminals is not less than 10 mOhm. Using a tester, check the integrity of the sensor connection circuit and, if necessary, restore it.
	The gap of the PRP-1M RPM sensor is not set to the required value. (S = $4^{}_{-0.5}$ mm)	Loosen the sensor mounting nuts, use a measuring tool to set the gap between the sensor and the idler to $4_{-0.5}$ mm, and tighten the mounting nuts.
	The PRP-1M sensor is faulty	Disconnect the two single-pin sensor connectors, unscrew the mounting nut, and remove the sensor from the bracket. Install the serviceable sensor in the reverse order and adjust the gap (see above).
The “POWER” LED does not light up	The power harness plug is not inserted correctly.	Turn the plug 180º and insert it into the socket.

5 Storage precautions

5.1 General storage requirements

To ensure long-term operation of the harvester, it is necessary to follow the rules for its storage during breaks in operation.

The harvester should be put into storage in accordance with the requirements of GOST 7751-2009.

The harvester should be put into storage: short-term – from 10 days to two months and long-term – more than two months.

Prepare the harvester for short-term storage immediately after the work completion, and for long-term storage no later than 10 days after the work completion.

When putting the harvester into and removing it from storage, observe safety regulations.

Storage areas must be provided with fire-fighting equipment and conditions for convenient inspection and maintenance, and, if necessary, quick removal from storage.

The harvester must be put into storage on a level horizontal surface so that it can be easily inspected and maintained, and, if necessary, quickly removed from storage.

When storing the harvester for long periods, place it on stands and a parking leg. There should be an 8-mm gap between the wheels and the supporting surface 10 cm.

When storing the harvester indoors, check its condition every two months; when storing it outdoors under canopy, check it every month.

After strong winds and rains, carry out the check immediately.

Any deviations from storage rules identified during inspections must be immediately corrected.

5.2 Preparation for storage

Preparing the harvester for storage involves carrying out a number of preventive measures to ensure its ability to resist destruction and aging and maintain a serviceable, functional condition (storability).

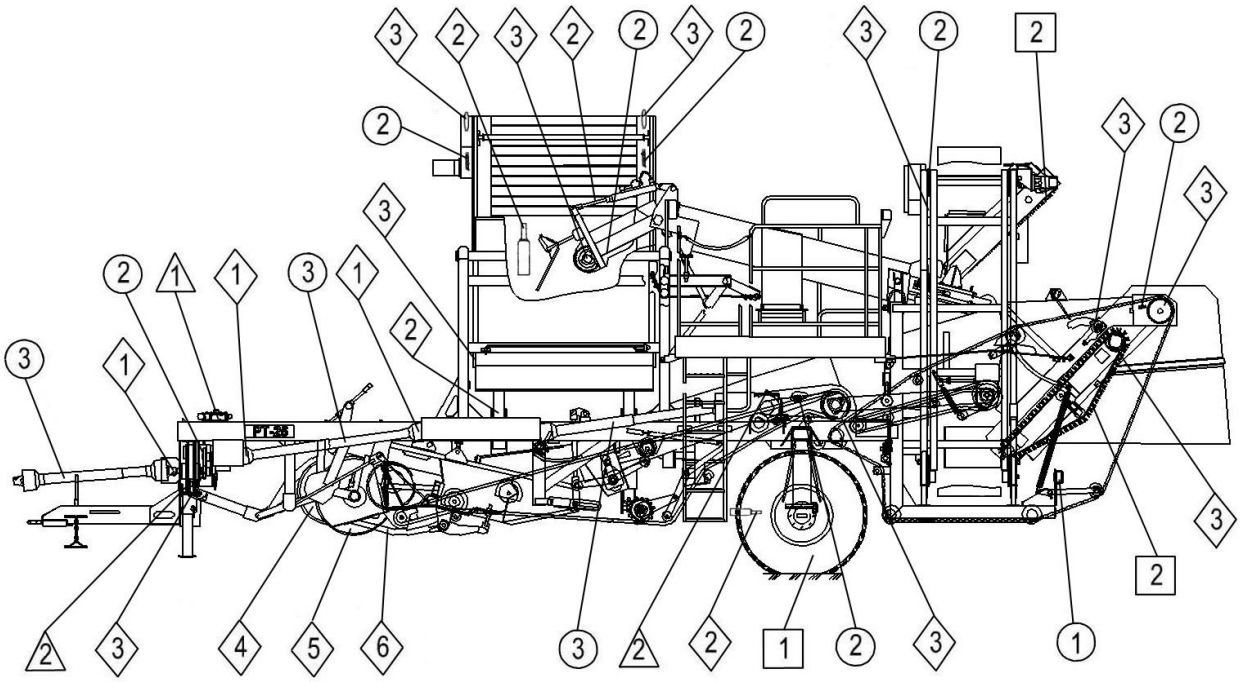
Before installation for storage and during storage, check the technical condition of the harvester and perform technical maintenance.

When preparing the harvester for storage, it is necessary to:

- clean the harvester from dust, dirt and plant debris by blowing and washing;
- lubricate the harvester in accordance with Table 3.2 and Figure 3.1;
- during storage, do not expose rubber parts (sleeves, etc.) to direct sunlight, and do not store them near heating devices;
- remove the chains, clean them, and rinse them in a cleaning solution (kerosene, diesel fuel, or gasoline). After drying, soak them for at least 20 minutes in engine or diesel oil heated to 80–90°C. Place them on the harvester in a loose position or roll them into rolls;

- cover all unpainted metal parts with an anti-corrosion compound;
- clean, wipe, degrease and paint areas with damaged paint;
- install the harvester indoors. Short-term storage without supports is permitted;
- reduce tire pressure to 70% of the nominal pressure.

Preservation of the harvester during storage must be carried out in accordance with the preservation scheme (Figure 5.1).



○ - removable for storage: 1 – rear lights; 2 - chains;
3 – propeller shafts with safety coupling

□ - coated with preservative: 1 – wheel tires; 2 – rubber mat of separating conveyors;
3 – hydraulic hoses

△ - sealed: 1 – oil tank; 2 – gearboxes

◇ - preserved: 1 – splined shaft ends; 2 – hydraulically operated rams; 3 – idlers;
4 – depth rollers; 5 – cutting discs; 6 – plowshares

Figure 5.1 - Conservation scheme

5.3 Short-term storage rules

Installing the harvester for short-term storage.

For short-term storage, store the harvester as a complete unit, without removing any assemblies or parts.

When preparing for short-term storage:

- carry out routine maintenance;
- clean the harvester from dust, dirt, plant debris and oil leaks;
- wash and blow the harvester with compressed air to remove moisture after washing;
- preserve: hydraulic cylinder rods, chain drive idlers, screw and threaded surfaces of tensioning and adjusting device parts;
- clean the hopper conveyor chains of dirt and rinse them with cleaning fluid (kerosene, diesel fuel, or gasoline). After drying, lubricate the chains with a brush or swab using automotive or diesel oil heated to 80–90°C. Rotate the conveyor with the lubricated chains at least 10 times.
- when storing the harvester in open areas under a canopy: place the harvester on supports, reduce the tire pressure to 70 - 80% of the nominal (Table 1.2). To protect against exposure to sunlight and precipitation, cover the tires with light-colored covers made of thick fabric or coat them with a special protective composition (lime whitewash, aluminum paints АКС-3 or АКС-4; chalk-casein composition containing 75% purified chalk, 20% casein glue, 4.5% slaked lime and 0.25% each of soda ash and phenol);

Store harvesters with appropriate distances between them (0.7 m) to allow for preventive inspections.

The distance between rows (1 m) must allow for installation, inspection and removal of the harvester from storage.

Inspect the harvester monthly during storage. Check immediately after heavy rains and winds. Correct any deviations from storage regulations that are identified during these inspections.

5.4 Long-term storage rules

Installing a harvester for long-term storage.

When preparing the harvester for long-term storage:

- carry out routine maintenance;
- clean the harvester from dust, dirt, plant debris and oil leaks;
- wash and blow the harvester with compressed air to remove moisture after washing;
- preserve: unpainted surfaces of sealed bearings, hydraulic cylinder rods, chain drive idlers, screw and threaded surfaces of tensioning and adjusting device parts;
- clean the hopper conveyor chains of dirt and rinse them with cleaning fluid (kerosene, diesel fuel, or gasoline). After drying, lubricate the chains with a brush or swab using automotive or diesel oil heated to 80–90°C. Rotate the conveyor with the lubricated chains at least 10 times.

- fill the harvester’s hydraulic system oil tank with oil to the upper level (under the breather);
- deliver the harvester to a storage area (canopy or closed room);
- when storing in open areas under a canopy, remove from the harvester: roller chains, lights, electrical equipment headlights, reflectors, propeller shafts and store indoors;
- after removing the components from the harvester, seal all cavities, openings, and gearboxes to prevent moisture and dust from penetrating;
- restore damaged paintwork of the harvester;
- place the harvester on stands;
- when storing the harvester in open areas under a canopy: place the harvester on stands, reduce the tire pressure to 70 - 80% of the nominal (Table 1.2). To protect against exposure to sunlight and precipitation, cover the tires with light-colored covers made of thick fabric or coat them with a special protective composition (lime whitewash, aluminum paints АКС-3 or АКС-4; chalk-casein composition containing 75% purified chalk, 20% casein glue, 4.5% slaked lime and 0.25% each of soda ash and phenol);
- drain the condensate from the pneumatic system receiver.

Clean the roller chains removed from the harvester, rinse them in washing liquid, soak them for at least 20 minutes in motor or diesel oil heated to 80–90 ºС, install them on the harvester in a weakened state or roll them into a roll.

Reinstall the mounting hardware for the removed harvester components. Attach tags to the removed components indicating the harvester's serial number.

When storing the harvester in a closed room, the component parts may not be removed if they are subject to preservation and sealing.

Without removing the electrical equipment from the harvester, clean it and blow it out with compressed air.

When storing the harvester outdoors under cover, coat the outer surfaces of the connecting hoses with a protective compound or wrap them with waxed paper or plastic film. Prepare the protective compound by mixing aluminum powder with oil varnish or aluminum paste with white spirit in a ratio of 1:4 or 1:5.

Store pneumatic tires unloaded on the harvester, supported by stands. Coat the tire surfaces with a protective compound (see above).

Reduce tire pressure to 70% of normal during indoor and outdoor storage.

Check the harvester's condition every two months when stored indoors, and monthly when stored under canopy. Inspect the harvester immediately after strong winds, rain, or snow drifts. Correct any deviations from storage regulations identified during these inspections. Pay particular attention to the condition of the external preservation.

5.5 Preservation methods

Preservation includes surface preparation, application of temporary protective agents, and packaging. The time between preservation stages should not exceed two hours.

Preservation should be carried out in specially equipped rooms or in assembly and other areas that allow for compliance with established technological processes and safety requirements. Preservation areas should be located to limit or prevent the penetration of aggressive gases and dust.

The room temperature must be no lower than 15°C, and the relative humidity no more than 70%. The harvester must undergo preservation without corrosion damage of metal and metal coatings.

Perform temporary anti-corrosion protection of the harvester according to protection options PO-1 (protection with preservative oils), PO-2 (protection with working and preservative oils) of dismantled, replaceable and spare parts, tools and accessories – according to PO-1, PO-2, PO-4.

In the absence of direct exposure to atmospheric precipitation, use liquid inhibited lubricants НГ-203 (А, В, С), НГ-204у, К-17, for internal preservation – АКОР-1 additive.

Apply preservative oils to the outer surfaces of parts or assemblies of the harvester by immersion, spraying or brush (swab).

Preserve the harvester according to the preservation scheme (see Figure 5.1).

5.6 Depreservation methods

Depending on the temporary protection options used, use the following depreservation methods:

- for protection options PO-1, PO-2, PO-4 – by wiping the surface with a rag soaked in low-viscosity oils or solvents, followed by wiping dry or blowing with warm air;
- immersion in solvents followed by drying or wiping dry;
- rinsing with hot water or synthetic detergents “Complex”, “Labomid-101”, “Labomid-102”, MS-6.

5.7 Removal from storage

When removing the harvester from storage:

- remove the harvester from the stands;
- clean and, if necessary, de-preserve the harvester and its components;
- remove the sealing devices;
- install the removed components onto the harvester;
- if necessary, change the oil in the gearboxes and oil tank (once every two seasons);
- inflate the tires of the running swivel wheels to the operating pressure (0.37 MPa);
- check and, if necessary, adjust the tension of chain drives, conveyor belts, axial play of bearings and brakes of running swivel wheels;
- lubricate the components of the harvester in accordance with Table 3.2 and the lubrication diagram (see Figure 3.1).

6 Completeness

The completeness is indicated in table 6.1.

Table 6.1 – Completeness

Designation	Name	Quantity	Marking of the stacking or packing place
PKK- 2-05_____ modification designation	Semitrailer potato harvester	1	
	* Set of spare and replacement parts, tools and accessories	1	
Set of technical documentation			
KPK-5-0100000A OM	Operation manual	1	
	Packing lists	1 set	
PKK-2-0000000 SJ	Safety justification	1	
Note - * Completed according to packing lists.			

7 Acceptance certificate

Semitrailer potato harvester ПКК-2-05 No. _____
serial number
manufactured and adopted in accordance with the mandatory requirements of state standards, current technical documentation, TS BY 400052396.061-2004 and approved for use.

Head of Quality Control Department

Seal here _____ _____
personal signature full name

_____
year, month, date

- -

cutting line for export delivery

Head of the enterprise

_____
designation of the document according to which delivery is in progress

Seal here _____ _____
personal signature full name

_____
year, month, date

Customer
(if available)

Seal here _____ _____
personal signature full name

_____
year, month, date

8 Manufacturer's warranties

8.1 The manufacturer guarantees that the harvester meets the requirements of the technical specifications TS BY 400052396.061-2004, provided that the costomer complies with the operating conditions, transportation and storage conditions, and the rules for technical and service maintenance established by this operation manual.

8.2 Warranty period of the harvester -_____.

The warranty period is calculated from the date the harvester is put into operation, but no later than 12 months from the date of purchase.

8.3 Warranty card - Appendix A.

8.4 Claims regarding the quality of the harvester must be satisfied in accordance with the legislation of the Republic of Belarus, Decree of the President of the Republic of Belarus No. 186 “On certain measures to increase responsibility for the quality of domestic goods” dated March 27, 2008 and Resolution of the Council of Ministers of the Republic of Belarus No. 952 “On the warranty period for the operation of complex machinery and equipment” dated June 27, 2008.

8.5 For export deliveries, the warranty period for the operation of the harvester and satisfaction of claims is in accordance with the contract.

Warranty service rules:

- the owner is obliged to promptly conclude a warranty service agreement for the harvester with the GOMSELMASH service center and register it within 10 days from the date of delivery of the harvester to the place of operation;
- when selling a harvester through intermediary organizations (seller) without the consent of the manufacturer, the seller bears warranty obligations;
- when contacting the service center, the owner must provide a warranty card for the harvester;
- for pre-sale preparation and warranty service, the owner has the right to contact any service center recommended by GOMSELMASH. Information on dealer centers is available on the website www.gomselmash.by;
- compliance with the operating rules and frequency of technical maintenance of the harvester is an essential condition for warranty service;
- the service center that provides warranty service for the harvester monitors and records warranty repairs and maintenance by filling out a warranty card;
- the harvester is serviced in accordance with the operation manual.

Warranty obligations do not apply:

1. In case of non-compliance with the requirements specified in this operation manual, including the use of operating and consumable materials that are not specified.
2. In case of violations of the frequency and scope of scheduled technical maintenance activities by more than 10% of the standard indicators specified in the operating documentation.
3. When using the product for other purposes.

Misuse of the product also includes working with adapters not intended for harvesting the corresponding crops, and using adapters with harvesters from third-party manufacturers without the consent of GOMSELMASH.

4. In case of changes in the design of the product or its components without the consent of GOMSELMASH.

5. If during the warranty period, technical maintenance of the product was not performed by service organizations authorized by GOMSELMASH.

6. When carrying out repair work or maintenance of the product using components or units that have not passed the GOMSELMASH Quality Control Department or are non-original.

7. If the consequences and defects are caused by non-compliance with the storage requirements of the product.

8. For damage or defects that arose as a result of an accident or during unauthorized disassembly or repair of units and assemblies not coordinated with GOMSELMASH.

9. For damage or defects that occurred during the operation of the product by an operator who has not studied the devices and operating rules of the harvester, has not undergone practical training and does not have a tractor driver's license with an open permit category.

10. In case of loss of the Warranty card. If the Warranty card is lost, a duplicate will not be issued, and the product is no longer covered by the warranty!

11. In the absence of records in the Warranty card on the performance of all maintenance activities stipulated by the operating documentation, certified by the seal of the service organization.

12. For components and assemblies of products subject to periodic replacement, specified in Table 8.1.

13. For replacement of consumables and wearing components.

14. For adjustment of the harvester.

15. The procedure for terminating the product's warranty service is initiated by the GOMSELMASH service department.

Table 8.1 – List of components and parts of the harvester subject to periodic replacement

No.	Name designation
1.	Rubber products (silent blocks, rings, collars, profiles, seals, covers, plates, caps, hoses for high-pressure and low-pressure pipes, conveyor belts, etc.)
2.	Drive belts, chains
3.	Electrical equipment (light bulbs, fuses, relays)
Note: when carrying out work on upgrading products in order to improve their technical characteristics, letters of the Russian alphabet are added to the digital designation of components and parts (for example - КЗК-10-0104502А), while the designation indicators and warranty obligations remain unchanged.	

9 Transportation

9.1 The harvester must be transported from the manufacturer by rail in a partially disassembled form on an open rolling stock or by road, in accordance with the regulations applicable to this mode of transport. The loading method, as well as the placement and securing of the packaging, must ensure the complete safety of the product. Transportation by tractor is permitted within the Republic of Belarus.

At the destination, accept the harvester in the presence of a railway administration representative. In the event of shortages or damage, a commercial report must be drawn up.

9.2 Unloading of the harvester should be carried out using lifting equipment with a minimum lifting capacity of 7 tons and the required lifting height. During unloading, sling the harvester at the locations designated on its components in accordance with the slinging diagram (Figure 9.1).

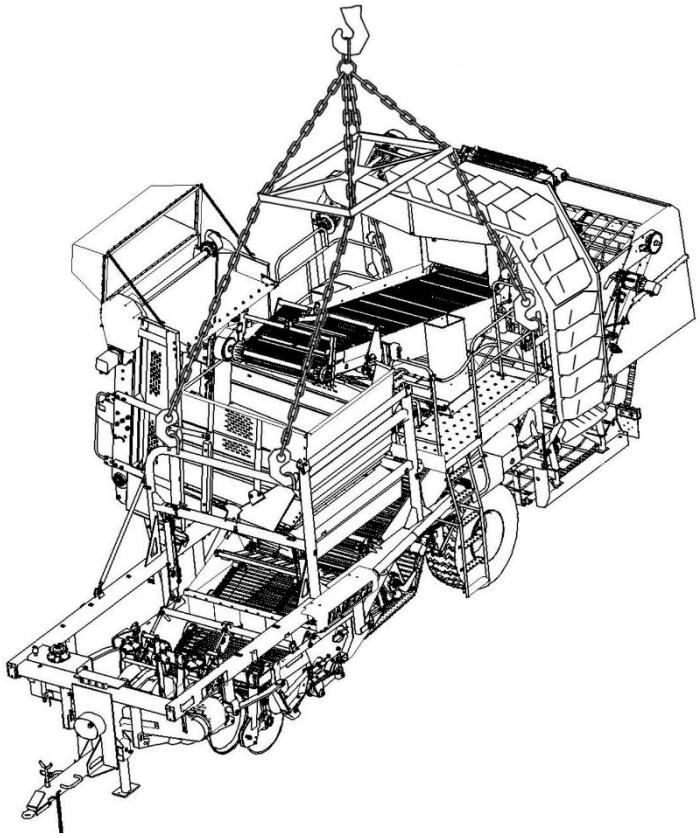


Figure 9.1 - Harvester slinging diagram

⚠ **ATTENTION:** When preparing the harvester for operation, remove the transport link installed to secure the hopper and the harvester frame during shipment to the consumer!

⚠ **It is PROHIBITED** to operate the harvester with the transport link installed.

9.3 From the unloading site to the farm, the harvester should be transported loaded onto a vehicle or matched with a tractor.

9.4 Transport the harvester, matched with a tractor, on public roads only during daylight hours, in compliance with the “Traffic regulations”.

10 Disposal

10.1 Safety measures

10.1.1 Disposal of the harvester after the end of its service life (8 years) or its components following routine repairs, maintenance and storage shall be carried out in compliance with safety requirements.

10.1.2 When disassembling the harvester, it is necessary to comply with the safety requirements of the instructions for the equipment and tools used during disposal.

10.2 Information and activities carried out to prepare and send the harvester for disposal

10.2.1 For disposal, the harvester must be disassembled in specialized workshops into assembly units and parts according to the following criteria: non-ferrous metals, ferrous metals, non-metallic materials.

10.3 Disposal methods

10.3.1 Drain used oil from the oil tank and gearboxes (Appendix E) into a designated container and dispose of it in accordance with environmental regulations. Discharging used oil onto the ground is strictly prohibited.

10.3.2 Waste oil disposal shall be carried out in accordance with the following regulations:

- prevent oil from entering domestic, industrial and storm sewer systems, as well as open bodies of water;
- if oil is spilled in an open area, it must be collected in a separate container, the spill area must be covered with sand and then removed.

10.4 To ensure safety when disposing of hydropneumatic accumulators, they must be discharged. Discharging the hydropneumatic accumulator is performed in the following sequence:

- remove the dirt-proof plastic cap from the gas filler plug (on top of the battery);
- using a hex key S=6, unscrew the gas filling hole plug by 1/4-1/3 turn until a characteristic hissing sound of escaping gas appears; do not inhale the released gas;
- after the hissing stops, unscrew the plug by additional 1/4-1/3 turn until the hissing reappears;
- gradually unscrew the cap (no more than two turns) and release the gas until the hissing stops. After this, the cap can be completely removed.

APPENDIX A
(required)

GOMSELMASH
Joint Stock company
“Gomel Foundry and Standards Plant”
246010, Gomel, Mogilevskaya st., 16,
tel. (0232) 59 61 31, fax (0232) 59 42 03, UNP 400051772

WARRANTY CARD

1 Semitrailer potato harvester PKK- 2-05
modification designation

2 _____
(date, month and year of issue)

3 _____
(serial number)

The harvester fully complies with the drawings and state standards.

The harvester is guaranteed to be in good working order for_____work from the date of its commissioning, but not later than 12 months from the date of purchase.

Head of the Quality Control Department of the plant _____
(signature)

Seal here

1 _____
(date of receipt of the product at the manufacturer's warehouse)

_____ _____
(Full name, position) (signature)

Seal here

2 _____
(date of sale (delivery) of the product by the seller (supplier)

_____ _____
(Full name, position) (signature)

Seal here

3 _____
(date of sale (delivery) of the product by the seller (supplier)

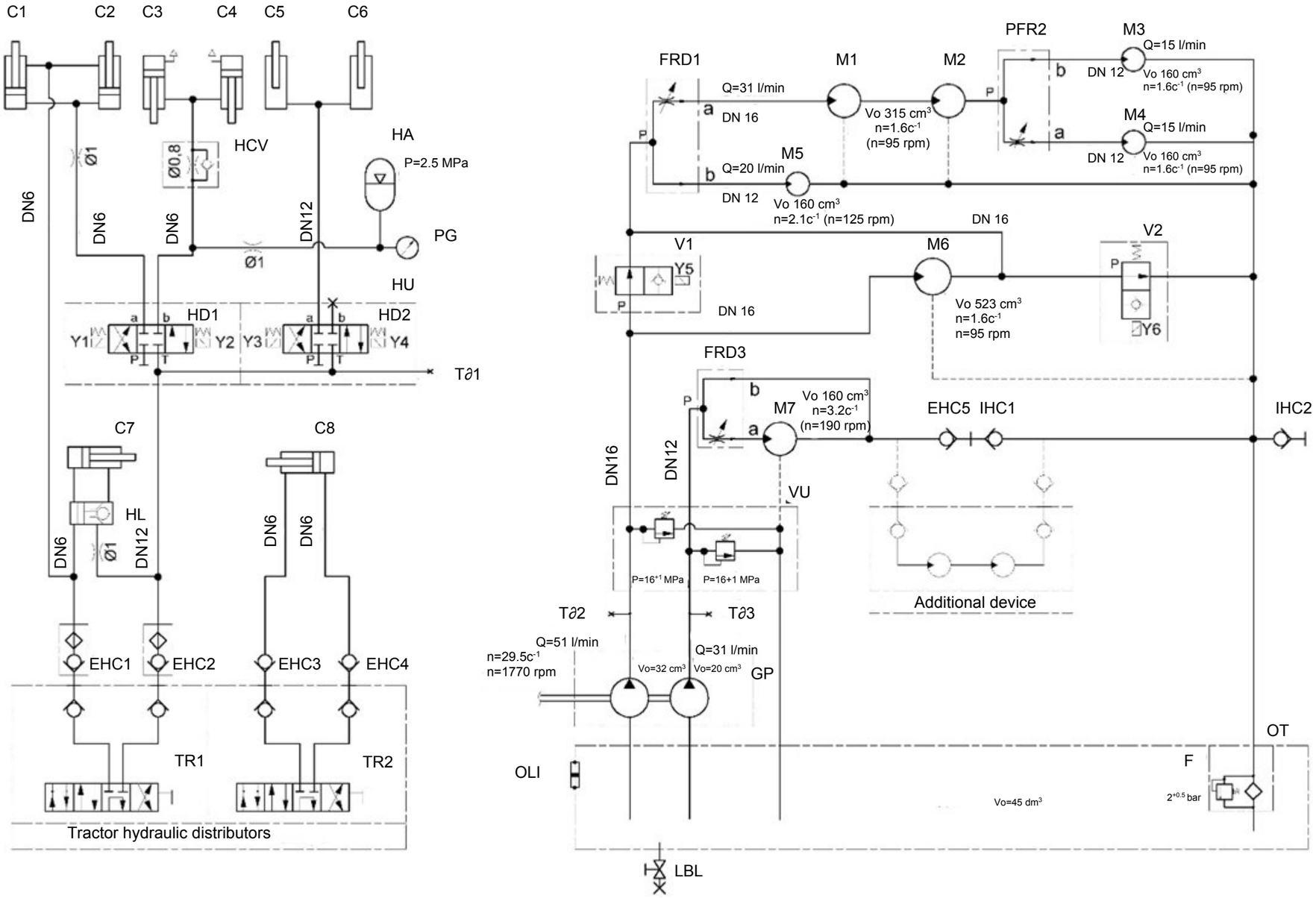
_____ _____
(Full name, position) (signature)

_____
(date of putting the product into operation)

_____ _____
(Full name, position) (signature)

Seal here

APPENDIX B
(required)

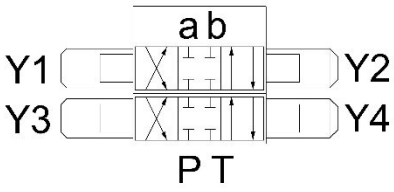
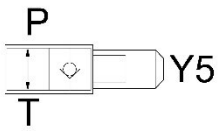
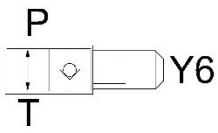


HA – hydropneumatic accumulator ; OT – oil tank; VU – valve unit; HU – hydraulic unit; P1, P2 – hydraulic distributors; HL– hydraulic lock; DOK – throttle with check valve; PG – pressure gauge; LBV – lever ball valve MM; M1 - M7 – hydraulic motors; GP – gear pump; EHC1 – EHC5 – external half-couplings; IHC1, IHC2 – internal half-couplings; FRD1 – FRD3 – 3-way priority flow regulator valve; OLI – oil level indicator; C1 - C8 – hydraulic cylinders; V1, V2 – electrically controlled valves; F – filter; Tð2 or Tð3 – threaded connections with a cap

Figure B.1 – Hydraulic circuit diagram of the ПКК-2-05 harvester

APPENDIX B
(required)

Table B.1 – Activation of hydraulic distributor solenoids

Consumer and type of transaction	Solenoid magnet number	Valve body diagram
1 Hydraulic cylinders C1, C2 for folding the hopper into the working and transport position	Y 1	
2 Hydraulic cylinder C3, C4 for transferring the digging section to the working-transport position	Y2	
3 Hydraulic cylinders C5, C6 for lifting and lowering the hopper	Y3	
4 Reserve	Y4	
Execution of the technological process 5 Turning on hydraulic motors: - lifting conveyor M1, upper tier slide M2, loading conveyor M3 and impurity conveyor M4; - inclined slide M5.	Y6	 
Shifting the mass in the hopper, with the implementation of the technological process 6 Turning on the hydraulic motor M6 of the hopper drive (Hydraulic motors M1, M2, M3, M4 and M5 are included)	Y5 and Y6	
Unloading from the hopper (process disabled) 7 Turning on the hydraulic motor M6 of the hopper drive (Hydraulic motors M1, M2, M3, M4 and M5 are disabled)	Y 5	

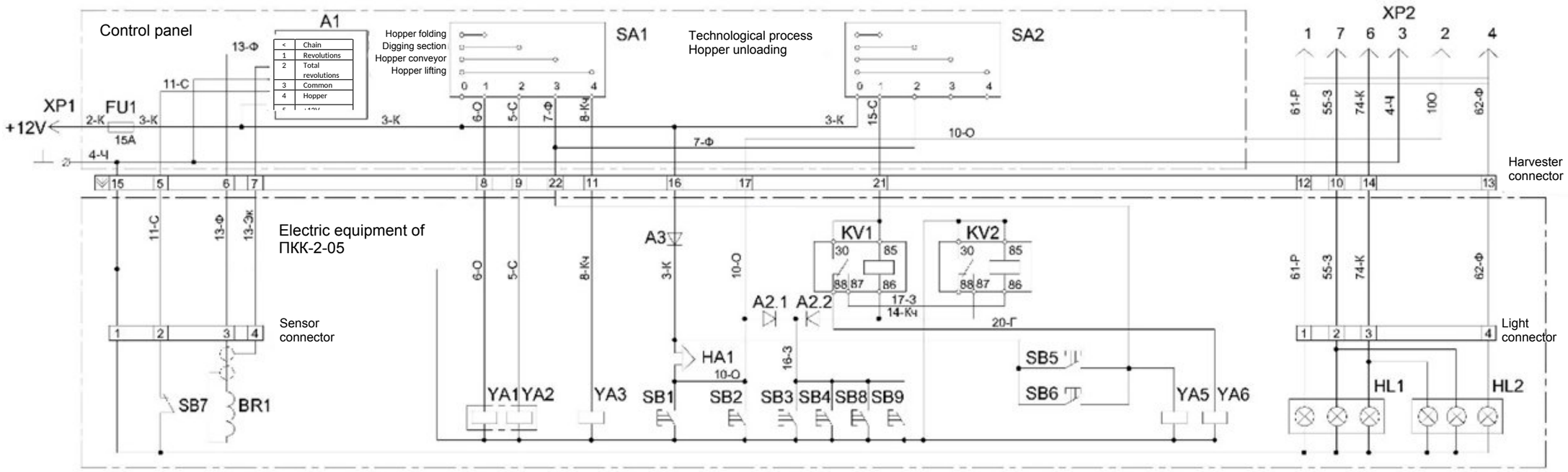
APPENDIX C
(required)

Table C.1 - List of elements of the electrical circuit diagram of the harvester

Designation	Name	Qty.
A1	Alarm board for the КПК 0701200	1
A2	Module МД4-5-2 УХЛ3.1	1
A3	Diode ДЧ607-2-1	1
BR1	Primary transducer ПрП-1М	1
FU1	Thermal bimetallic fuse 293.3722	1
HA1	Horn 20.3721-01	1
HL1, HL2	Multifunctional rear light 7303.3716 (12 V)	2
KV1, KV2	Relay 902.3747	2
SA1, SA2	Switch П4ПНГ-15	2
SB1, SB2	Control button ABLFS -22 (green)	2
SB3, SB4	Mushroom button AEA-22 (red)	4
SB5, SB6	Control button ABLFS-22 (blue)	2
SB7	Switch ВК12-21	1
XP1	Plug 47к	1
XP2	Plug Б7-1	1
YA1… YA3, YA5, YA6	Solenoid magnet (hydraulic distributor set)	5

APPENDIX D
(required)

Alarm and control system					Harvester work unit control system									Light signaling system					
		Alarms												Left rear light			Right rear light		
Power supply = 12V	Fuse	Hopper filling	Inclined conveyor or inclined slide	Alarm board	Hopper folding to transport position	Digging section	Hopper raising / lowering	Horn	Horn buttons	Emergency process control buttons	Emergency stop and process interlock relay	Hopper conveyor relay and buttons (mass shift)	Hopper unloading	Process activation	Turn	Close signal	Stop	Stop	Close signal	Turn



Example of the symbol
2-K

Wire color
Wire number

Figure D.1 – Schematic diagram of the electrical circuit of the harvester

APPENDIX E
(informative)

Filling volumes

Table D.1

Name	Volume, dm^3 (l)	Brand of oils and working fluids	
		main	substitutes
Oil tank	45	Oil М-10ДМ GOST 8581-2021	Oil МГЕ-46В ТУ 38.001347-2000
Bevel gear	1.3	Oil $ТА_Д$-17 GOST 23652-79	Oil ТМ 5-18 GOST 17479.2-85 or oil ТМ 2-18 GOST 17479.2-85
Cylindrical gearbox	2.5	Same	Same

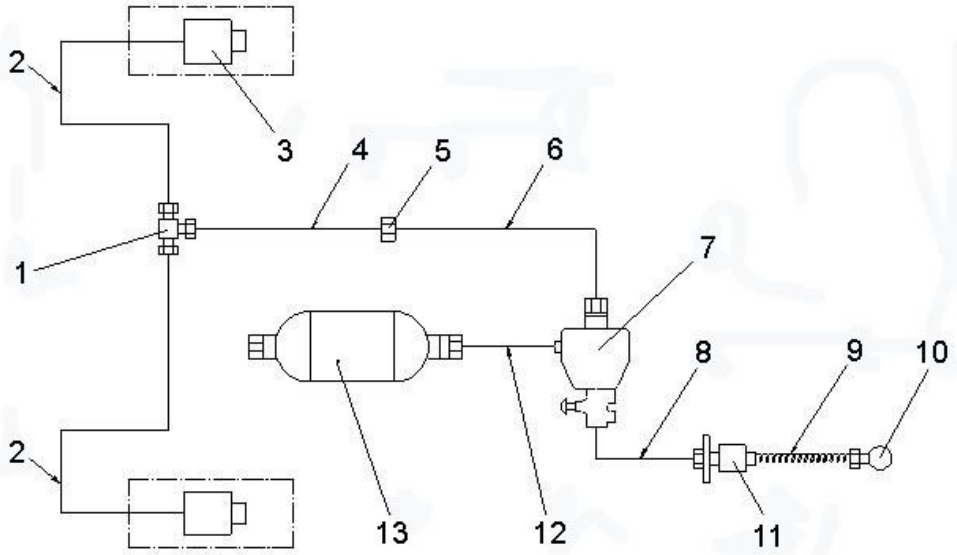
APPENDIX F
(informative)

Torques of the main threaded connections

Table F.1

Tightening torques	Meaning	
	N.m	kgf.m
Nuts (M20x1.5) for bolts securing the frames of the lifting and unloading conveyors to the main frame	392 - 490	40 - 50
Nuts (M12) for the bolts securing the frame of the hopper loading conveyor to the main frame and to the frame of the lifting conveyor	78.5 - 98	8 - 10
Wheel hub bearing mounting nut and washer	40 ± 5	4 ± 0.5
Nuts (M18) for fastening the wheel hub to the rim	274 - 313	28 - 32
Nuts (M20x1.5) for fastening bolts beams of the running wheels to the main frame	392 - 490	40 - 50

APPENDIX G
(informative)



1 – tee; 2 – hoses; 3 – brake chamber; 4, 6, 12 – pipelines; 5 – fitting; 7 – air distributor; 8 – pneumatic tube; 9 – spiral tube; 10 – connecting head; 11 – main filter; 13 – receiver

Figure G.1 - Pneumatic wiring diagram

APPENDIX J
(informative)

Information on precious metals

Table J.1

Name Designation	Assembly units, complexes, kits		Quantity in the product	Weight 1 pc., g	Mass in the product, g
	Designation	Quantity			
Gold					
Remote control КПК-5-0700040	КПК-5-0012000	1	1	0.000155	0.000155
				Total:	**0.000155**
Silver					
Switch ВК12-21 TS BY 07512465.017-94	КПК-5-0100000А	1	1	0.1044	0.1044
Remote control КПК-5-0700040	КПК-5-0012000	1	1	3.767263	3.767263
Relay 902.3747 TR 37.003.1418-94	КПК-5-0100000А	2	2	0.1321	0.2642
				Total:	**4.003763**

APPENDIX L
(required)

Information on the preservation, depreservation and represervation of the harvester is contained in Table L.1.

The column “Work name” also indicates the brand of oil used for preservation.

Table L.1

Date	Work name	Validity period, years	Position, last name and signature

Note: Filling out the “Preservation” section is mandatory at the harvester manufacturing plant, technical centers and farms.

APPENDIX M
(required)

Record of operating hours and technical maintenance

Table M.1

Date of the next technical maintenance	Operating time, h		Type of maintenance	Full name and signature of the person responsible for technical maintenance and repairs
	until the next technical maintenance	increasing as a result		

Note: Completing the section "Record of operating hours and technical maintenance" is mandatory at the harvester manufacturing plant, technical centers and farms.