



PRODUCER OF AGRICULTURAL MACHINERY



CAROUSEL RAKE

ZK 480

SERVICE MANUAL PARTS LIST



Caution!
This service manual is a part of the rake.
Please keep the manual for future use.

Serial number

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EC declaration of conformity for machines.

We, **MESKO-ROL** sp. z o.o.
26-111 Skarżysko-Kamienna ul. I. Mościckiego 51

declare with full responsibility that the machine

ZK 480 ROTARY RAKE

factory no.

year of manufacture

to which this declaration relates meets the requirements of:

- Directive 2006/42/EC
- Regulation of the Minister of Economy of 21.10.2008 on general requirements for machines (Polish Journal of Laws Dz. U. No 199 item 1228)
- harmonised standards:
 - PN-EN ISO 12100-1 - Safety of machinery. Basic concepts, general principles for design Part 1: Basic terminology, methodology
 - PN-EN ISO 12100-2 - Safety of machinery. Basic concepts, general principles for design Part 2: Technical principles and specifications.
 - PN-EN ISO 4254-1 - Agricultural machinery. Safety. Part 1: General requirements.
- non-harmonised standards:
 - PN-ISO 11684:1998. Tractors, agricultural and forestry machinery, motorised tools. Safety marks and warning icons. General principles.

This declaration shall become invalid in case any changes or modifications to the machine are made without the manufacturer's written consent.

Skarżysko-Kamienna 18-03-2016

Jacek Kowalski
President of the Board of MESKO-ROL

1. INTRODUCTION

Due to the importance of information contained herein, this instruction manual constitutes an integral part of this machine. It is recommended that the supplier of the hay rake, either used or brand new, keeps a signed confirmation of receiving this manual together with the machine.

The hay rake was made in accordance with all applicable safety standards. Observance of descriptions and warnings contained in this manual guarantees full operating safety.

Identification data of the hay rake are located on a nameplate fixed to the machine frame.

In order to keep the machines in perfect condition, we recommend using only genuine, dedicated parts manufactured by "MESKO-ROL".

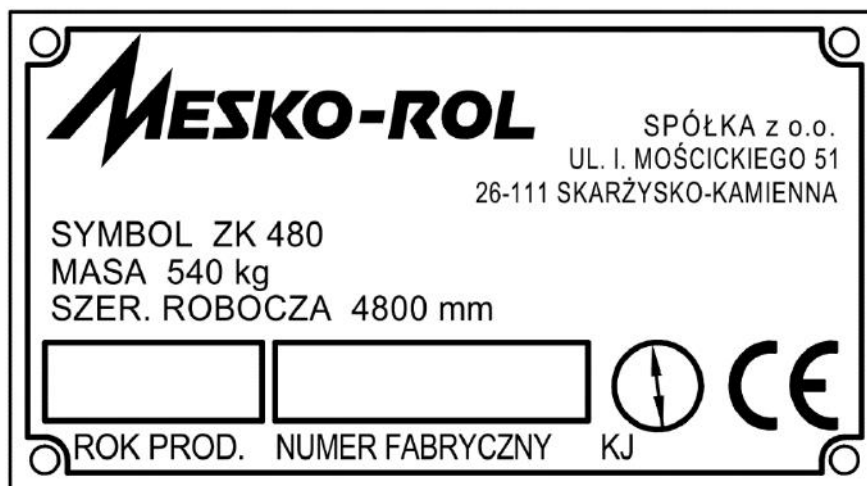
NOTE! In case of doubt, or if the information contained in this instruction manual is unclear, please contact the dealer or „MESKO - ROL" Sales Department.

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The nameplate presented below is located on the machine at the location presented on fig.



MESKO-ROL uses a policy of constant improvement of its products. We reserve the right to implement changes and improvements that we deem necessary. This does not include an obligation to modernize already sold machines, however.

2. USE ACCORDING TO PURPOSE

The hay rake is designed exclusively for agricultural operation, namely for raking grass and green fodder and hay on arable land and meadows with flat surface free from rocks, obstacles, and with maximum inclination of 12°.

Use of the machine for other purposes will be deemed as inappropriate.

Fulfilment of the requirements related to operation of the machine, its service and repairs as instructed by the manufacturer, and strict observance of the manufacturer instructions is the precondition for appropriate use.

The hay rake may be operated, maintained and repaired only by persons acquainted with its detailed characteristics, who possess the knowledge of all applicable safety procedures.

Accident prevention regulations, as well as all basic occupational safety and health regulations, including traffic regulations, must be observed at all times.

Making changes to the machine without the manufacturer's consent may relieve the manufacturer from liability for any resulting damage.

3. OPERATING SAFETY



IMPORTANT INFORMATION FOR USERS

DANGER WARNING SYMBOL

This danger warning sign points to important information concerning dangers provided in the instruction manual.

Beware of danger on seeing this sign, and read the corresponding information carefully.

3.1. GENERAL SAFETY RULES

MAINTAIN CAUTION - READ THE INSTRUCTION MANUAL CAREFULLY TO MINIMISE RISKS TO YOUR SAFETY AND THE SAFETY OF OTHERS



REMEMBER to observe all safety rules, and to maintain safety precautions both related to the hay rake, as well as general operating safety. Each user of the hay rake should fully understand all possible dangers and preventive measures.



NEVER allow children to play with the hay rake or near it, even when it is not operational or during storage.

Do not allow people to sit, hang from, or drive on the raking arms.

Inform all nearby children and adults on the operating dangers related to the hay rake.



BEFORE engaging rotary motion of the raking arms manually or through the tractor drive, even during standstill or storage, make sure that there are no persons or animals within the reach of raking arms.

After propelling, even manually, the raking arms can cause severe bodily injuries to persons or animals standing within their reach, or pierce them with raking teeth as a result of uncontrolled rotation of these teeth from horizontal position to vertical position towards the ground.



NEVER allow children to operate the hay rake

NEVER allow persons unfamiliar with its operation and safety rules to operate the raking arms.

3.2. DETAILED SAFETY RULES



3.2.1. PREPARING FOR WORK

- **READ** the instruction manual carefully. Make sure that you are well acquainted with all descriptions concerning safety and operation of the hay rake, in particular related to preparing for work, transport or storage.
The manufacturer is not liable for any injuries or material damage resulting from failure to observe the instructions contained herein.
- **THE OPERATOR** should have their clothing carefully buttoned; it cannot be too loose, to prevent being caught by protruding parts, or entangled into rotating parts.
- **TO DRIVE** the hay rake, use a telescopic articulated shaft, as specified in the instruction manual.
Attach the shaft end with the overload clutch to the power take-off (PTO) of the hay rake.
Secure the guards of the telescopic articulated shaft against rotation, as specified in the instruction manual.
Do not use any articulated telescopic shafts other than those specified in the operating manual.
The articulated telescopic shaft should have complete guards on.
Never use a shaft that is damaged or lacking the safety guards.
- **PURSUANT TO THE REGULATION** of the Minister of Infrastructure of 31.12.2002 on technical conditions for vehicles and the scope of their mandatory equipment, Polish Journal of Laws Dz.U. No 32/2003 item 262 as amended, a transported hay rake should be equipped with a mobile light warning device and a slow-moving vehicle emblem, as specified in the parts catalogue, which should be placed on the hay rake as shown in fig. 14.
- **BEFORE PROCEEDING** to couple the hay rake with the tractor, inspect the condition of the entire hay rake, tighten all bolts, and check proper fixture of all moving and guarding elements.
Check operation of the hay rake by manually rotating the arms, taking care not to injure nearby persons or animals.
- **MOST** accidents take place in the area between the tractor and the machine, therefore particular caution should be exercised when attaching and detaching the hay rake.
- **THE HAY RAKE** should always be coupled to a tractor of adequate class, as specified in the instruction manual.
- **CAREFULLY APPROACH** with the tractor to the hay rake's three point linkage and PTO attachment points, making sure that there are no humans between the tractor and the hay rake.

The coupling action should be performed only after stopping the tractor, turning off its engine, removing the key from the ignition switch, and placing wedges under the tractor wheels.

- **ATTACH** the hay rake only to genuine and correctly functioning three-point linkage (TPL), and secure it against accidental and uncontrolled detachment.
- **BEFORE EACH LIFTING** of the hay rake, make sure that there are no persons or animals standing within the range of the hay rake.
- **YOU MAY START THE HAY RAKE** only after correct setting of all elements to working position. It is forbidden to start the hay rake in the transport setting!
- **AFTER MAKING SURE THAT** there are no nearby persons or animals within the reach of the teeth or in their vicinity, the hay rake can be started to check proper operation of the machine, the functioning of the lifting mechanism, and the functioning of the lights of the mobile light warning device.
- **DO NOT LEAVE THE HAY RAKE UNATTENDED** when lifted by the tractor three-point linkage.
- **BEFORE LEAVING** the tractor, lower the hay rake onto a hard and even ground, disable the PTO drive, stop the engine and remove the key from the ignition switch at all times.
- **BEFORE SETTING** the hay rake for transport, always disconnect the articulated telescopic shaft from tractor PTO.
- **NEVER START** the tractor in enclosed spaces.
- **IN CASE OF** insufficient weight on the front axle of the tractor, always use front weights for counter-balancing.
- **APPROACH THE MACHINE** only after complete halting of the hay rake rotation and tractor engine.
- **IN LIFTED STATE**, secure the hay rake from uncontrolled descent by placing a landing leg in the upper or lower position.
- **PRIOR TO PROCEEDING** to adjust ground clearance of the raking teeth using the crank (item 7 fig. 3), stop the tractor engine, remove the key from the ignition and engage the handbrake.



3.2.2. TRANSPORTING

- **REMEMBER** that the hay rake is deemed to be properly prepared for transportation only after setting it to transport position, and fitting it with a mobile light warning device and the regulatory emblem.

- **OPTIMUM LIGHTING VISIBILITY** is ensured after attaching the hay rake to the tractor in suspended position in accordance with operating requirements, in such manner that its upward tilt is minimum. This is obtained by fixing the central link of the tractor three-point linkage system in the upper holes, if the tractor features such additional holes.
- **LIFT THE RAKE** suspended on the tractor to transport position, to such height that the distance of the upper edge of the light surface of the red reflective light from the road surface is max. 1200 mm.
- **FOR TRANSPORTING ON ROADS**, block the rake side tilt with the latch.
- **WHEN DRIVING, ALWAYS REMEMBER** the increased machine dimensions.



3.2.3. OPERATION

- **PRIOR TO RESETTING** the hay rake from transporting to operating state, always turn off the engine and remove the key from ignition, and immobilize the tractor.
- **ARTICULATED TELESCOPIC SHAFT** should be attached after completing all the actions related to resetting the hay rake to working state.
- **BEFORE STARTING THE HAY RAKE**, make sure that there are no nearby persons or animals within the reach of the hay rake and in its vicinity.
- **NEVER ALLOW** the hay rake arms to move when the machine is lifted by the tractor's hydraulic lift.
- **MAINTAIN SPECIAL CAUTION** when resetting the hay rake from transporting to working position. Its total width will change after conversion, and the teeth move from horizontal to vertical position towards the ground when rotating the arms.
- **WHEN OPERATING** the hay rake, make sure that there are no persons or animals within the range of 50 m from the tractor-hay rake assembly.
The landing leg should be set in upper position.



3.2.4. UNCOUPLING HAY RAKE FROM TRACTOR FOR PARKING AND STORAGE

- **BEFORE UNCOUPLING** the hay rake from the tractor, make sure that the hay rake does not slide off and roll unexpectedly.
- **IN LIFTED STATE**, secure the hay rake from uncontrolled falling, and set the **supporting leg** in lower position for parking.

- **AFTER PLACING** the hay rake on the ground and stopping the tractor engine, immobilizing the tractor and removing the key from ignition switch, decouple the **articulated telescopic shaft** from tractor PTO first.
- **PARK AND STORE THE HAY RAKE** in places not frequented by children, other persons or animals.
- **SECURE THE HAY RAKE** against the access of children, and block the arms from rotating.
- **WHEN UNCOUPLING** the rake from the tractor, always place it on the landing leg.



3.2.5. MAINTENANCE

- **Perform maintenance on the hay rake** while it is parked, before coupling it with the tractor. If the hay rake needs to be serviced while coupled to the tractor, proceed as follows:
 - place the hay rake on the ground;
 - stop the engine, immobilize the tractor, remove the key from the ignition switch, and disconnect the articulated telescopic shaft.
- inspect the condition of screw joints daily and tighten if necessary prior to work.
- inspect components for wear or damage, and replace if necessary with new, genuine manufacturer parts; only genuine and dedicated parts can guarantee the required quality of the repaired machine.



3.2.6. SAFETY LABELS

The hay rake has warning labels with safety icons stuck in locations shown in figure 1. The labels contain clear safety instructions and notes, ensuring the safe operation of the machine.

Take careful note of each warning sign, and read its meaning in the following chapter of the manual.

Warning labels should be kept in a clean and legible condition for the entire lifetime of the hay rake.

Replace warning labels with new ones in case of decreased legibility, damage or loss.

New assemblies and parts used for repairs should be fitted with all the warning labels specified in this instruction manual.

Brand new warning labels can be purchased at points of sale or from the manufacturer; they are listed as normal spare parts. Refer to label reference number when ordering and purchasing.

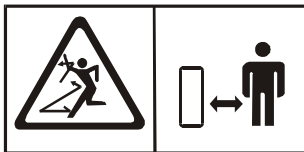
List of warning and information labels placed on the hay rake.



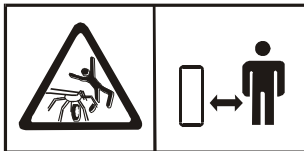
Read the instruction manual before operation.



Stop the tractor engine and remove the key from the ignition switch before performing service or repair works.



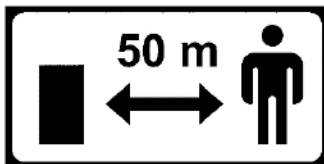
Danger from flying objects. Maintain safe distance from the machine.



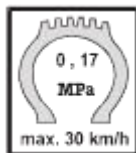
Danger of leg getting caught by the machine. Maintain safe distance from the machine.



It is prohibited to stay, or perform maintenance, inspection or repairs within the reach of the lifted hay rake.



Keep specified distance from people and animals when operating.



Maintain adequate pressure in tyres.



Maximum PTO revolutions



Hooking points for lifting equipment

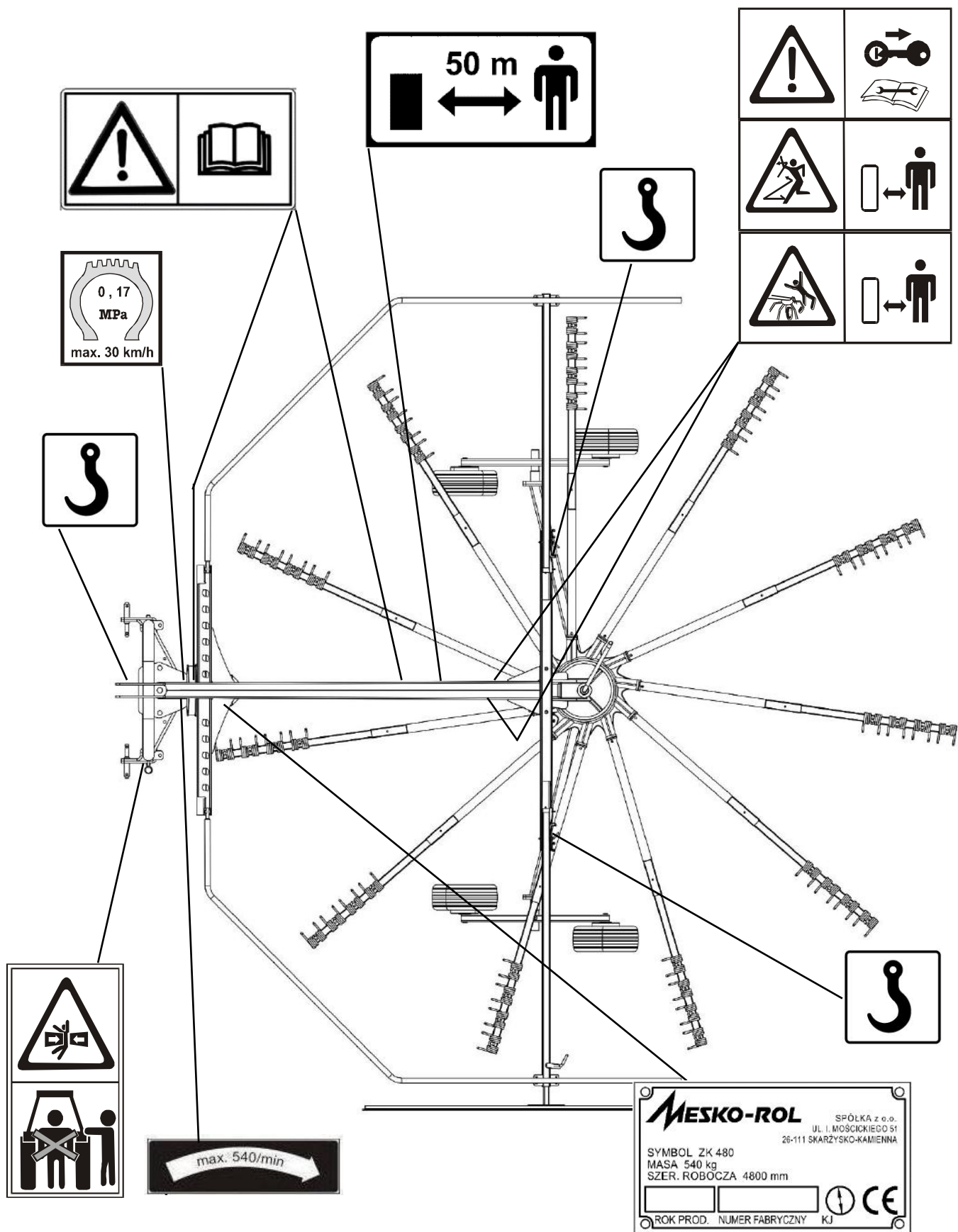


Fig.1 Location of warning plates on the hay rake.

3.2.7. HAZARDS



CAUTION! Hay rake is a dangerous machine. The hay rake may only be operated by persons who have carefully read and understood the contents of this manual. Never allow children to operate the hay rake. Never allow children to play on the hay rake or near it, even after stopping or during storage.



3.2.8. RESIDUAL RISK

The manufacturer has made all efforts to ensure that the rotary hay rake is safe to use. However, it is not possible to eliminate all hazards related to the operation of the machine. Each user should be fully aware of the existing dangers (e.g. related to moving parts), and should avoid them. To reduce residual risk, the instructions on safety labels, and those contained in this manual should be strictly observed.

When operating the hay rake, maintain safety measures related to the operation of the tractor and the entire assembly.

4. HAY RAKE OPERATION



The hay rake may only be used after carefully reading the contents of this operating manual.

4.1. GENERAL SPECIFICATION AND DESCRIPTION OF HAY RAKE

The main assembly of the machine (fig. 2) is gear 1, which is the central structural node, and the main driving system for raking arms.

Main frame 2 is the basic bearing structure of the whole machine. Three point frame 3 is located at the front of main frame 2, and is used for performing attachment through three-point linkage of the tractor.

Wheels arm 5 with supporting wheels 6 is located at the bottom on the gear sleeve 1. The machine includes four supporting wheels, which ensures better raking on uneven land. The long end of wheels arm 5 is supported by adjustment screw 7. In lifted state of the hay rake, the position of the beam with supporting wheels 6 can be raised or lowered by screwing in or out the adjustment screw with crank 7.

Intermediate arms 8 are fixed to the arms protruding from gear 1; they support sliding end arms 9 with raking teeth 10. End arm 9 is fixed to intermediate arm 8 through cotter 11 (fig. 4).

Transmission from tractor PTO to gear 1 is performed through an articulated telescopic shaft and an intermediate shaft placed in main frame 2.



CAUTION!

To drive the hay rake, use only telescopic articulated shafts with overload coupling. 45R-502-3-HA-P45B1 shaft by SIPMA, Lublin is recommended.

Noise and vibrations.

The operator operates the machine while sitting in the tractor cabin. No vibration hazards apply during operation of the machine. The designated operator position is in the cabin, the seat of which is dampened, and has an ergonomic design.

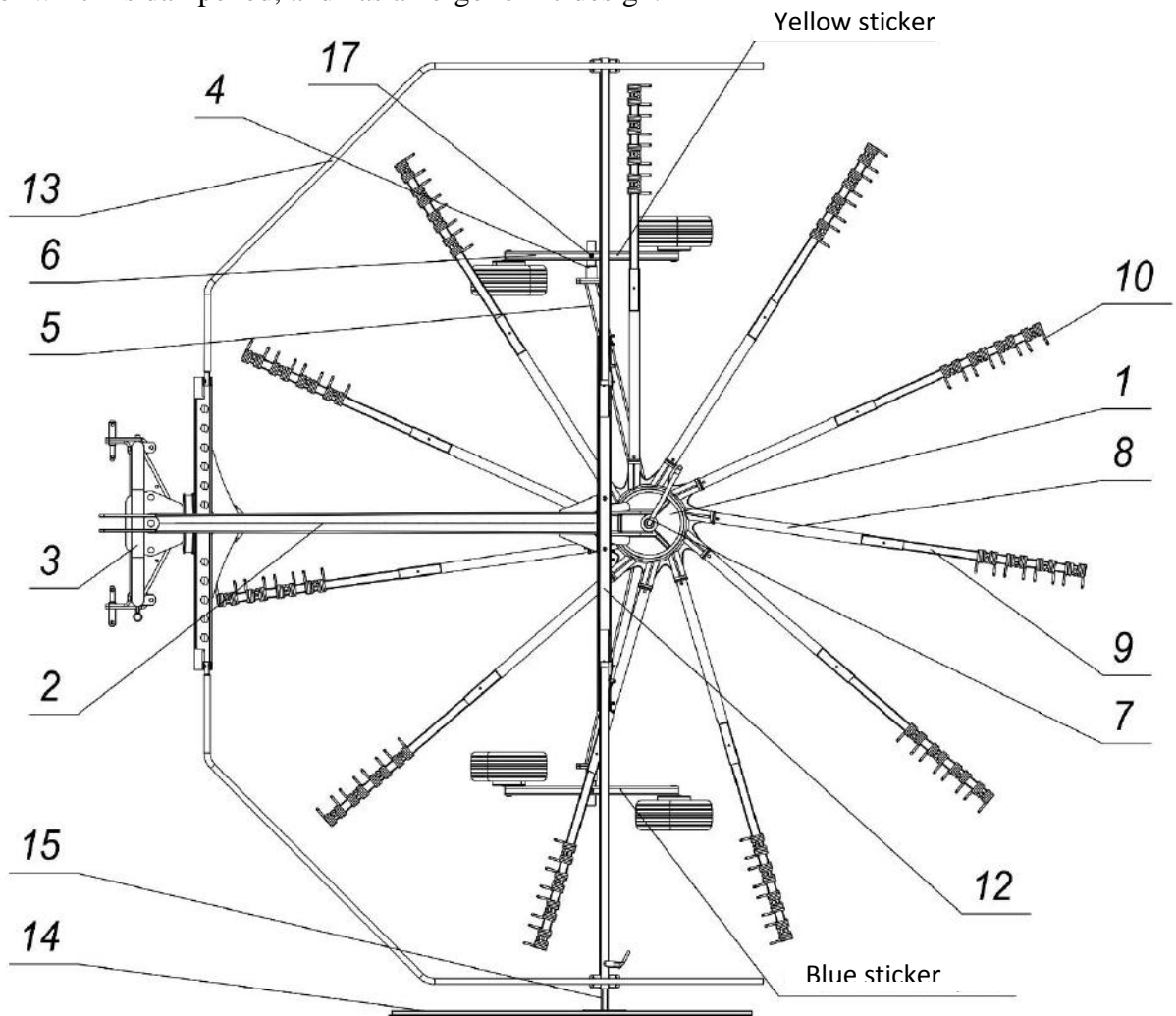


Fig. 2

- 1 – Rake gear, 2 – Main frame, 3 – Three-point frame,
- 4 – Wheel axle, 5 - Wheels arm, 6 – Beam with supporting wheels, 7 – Adjustment screw with crank,
- 8 – Intermediate arm, 9 – End arm, 10 – Teeth, 12 – Middle beam set., 13 – Protective yoke,
- 14 – Screen, 15 – Screen arm, 17 – Grease nipple.

4.2. ADJUSTMENTS AND SETTINGS

4.2.1. ADJUSTMENT OF RAKING TEETH GROUND CLEARANCE

Raking quality is directly dependent on the position of raking teeth ends 10 (Fig. 3) relative to the ground.

The position of raking teeth relative to the ground depends on:

- the height of supporting wheels 6 relative to the teeth ends 10, adjustable by turning the screw with crank 7,
- level of digging of supporting wheels 6 into the ground,
- tilting of hay rake frontwards or backwards, depending on the length setting of three-point linkage central link 31 of tractor. (Fig. 3)
- compactness of ground and root system,
- crop size and its humidity.

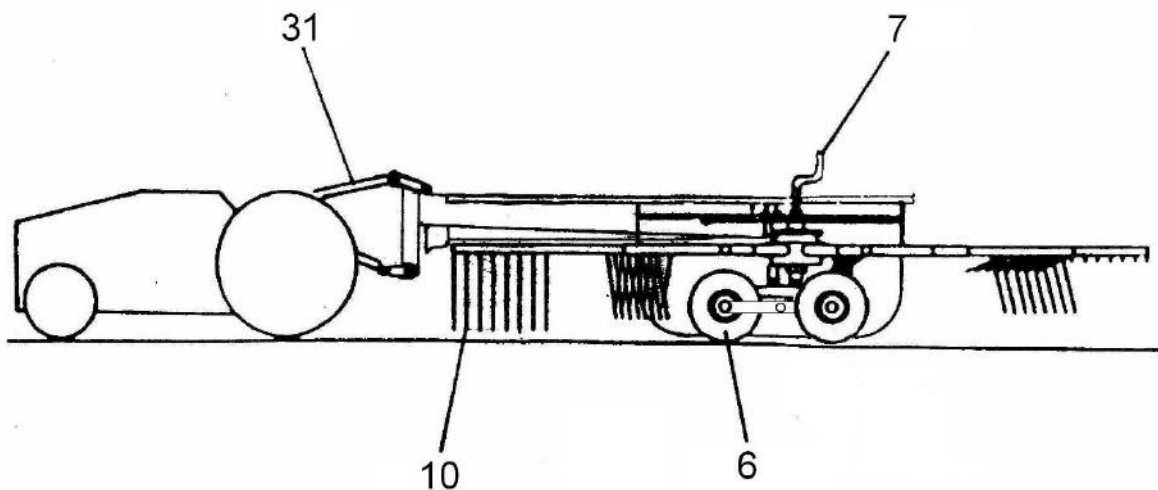


Fig. 3

6 - Supporting wheel, 7 - Screw with crank, 10 - Teeth, 31 – three-point linkage central link.

The correct setting of the raking teeth height relative to the ground is required from operator for the purpose of:

- obtaining good crop raking efficiency,
- avoiding destruction of upper ground surface and root system, and avoiding contamination of the crop collected.

4.2.2. SETTING END RAKING ARMS AND SCREEN IN OPERATING POSITION OR TRANSPORTING POSITION



WARNING!

Always make sure that the securing pin set 11 is positioned as shown on figure 4 after inserting into the hole, for locking end arm 9 in intermediate arm 8.

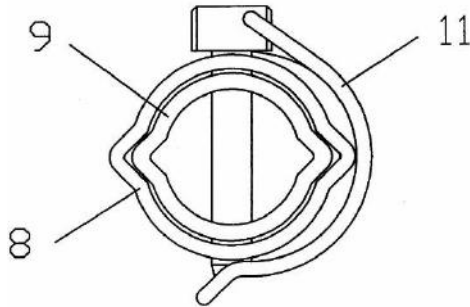


Fig. 4 Correct position of securing pin set 11 when joining end arm 9 in intermediate arm 8.

END ARMS AND SCREEN SET IN OPERATING POSITION

For working position, the end raking arm and screen must be set as shown on figure 5.

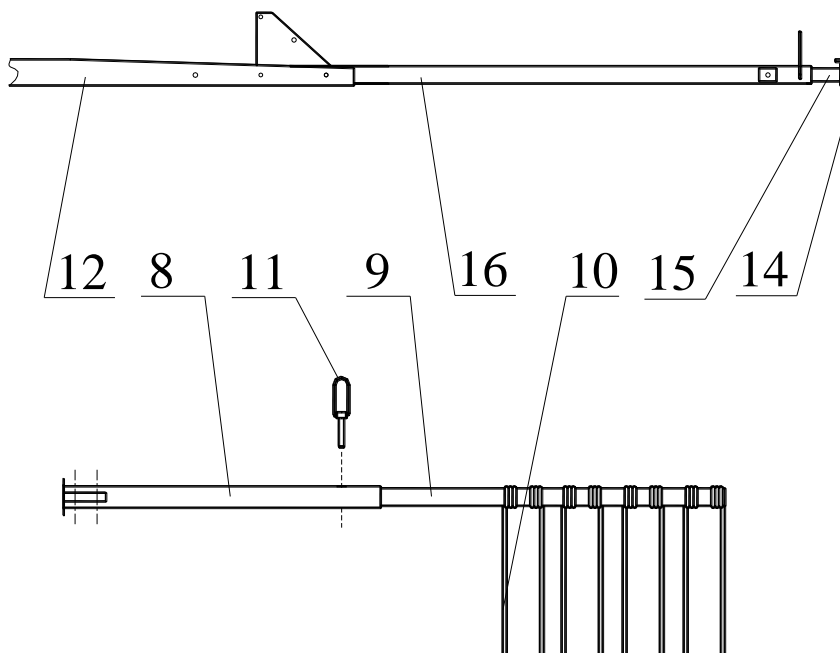


Fig. 5

8 – Intermediate arm, 9 – End arm, 10 – Teeth, 11 – Securing pin set,
12 – Central beam set, 14 – Screen, 15 – Screen arm, 16 – Side arm.

END ARMS AND SCREEN SET IN TRANSPORTING POSITION

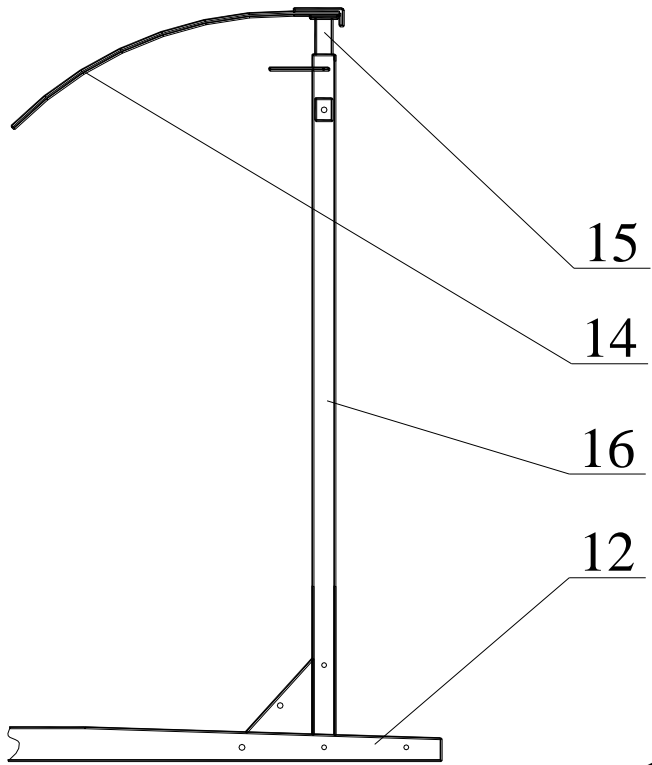
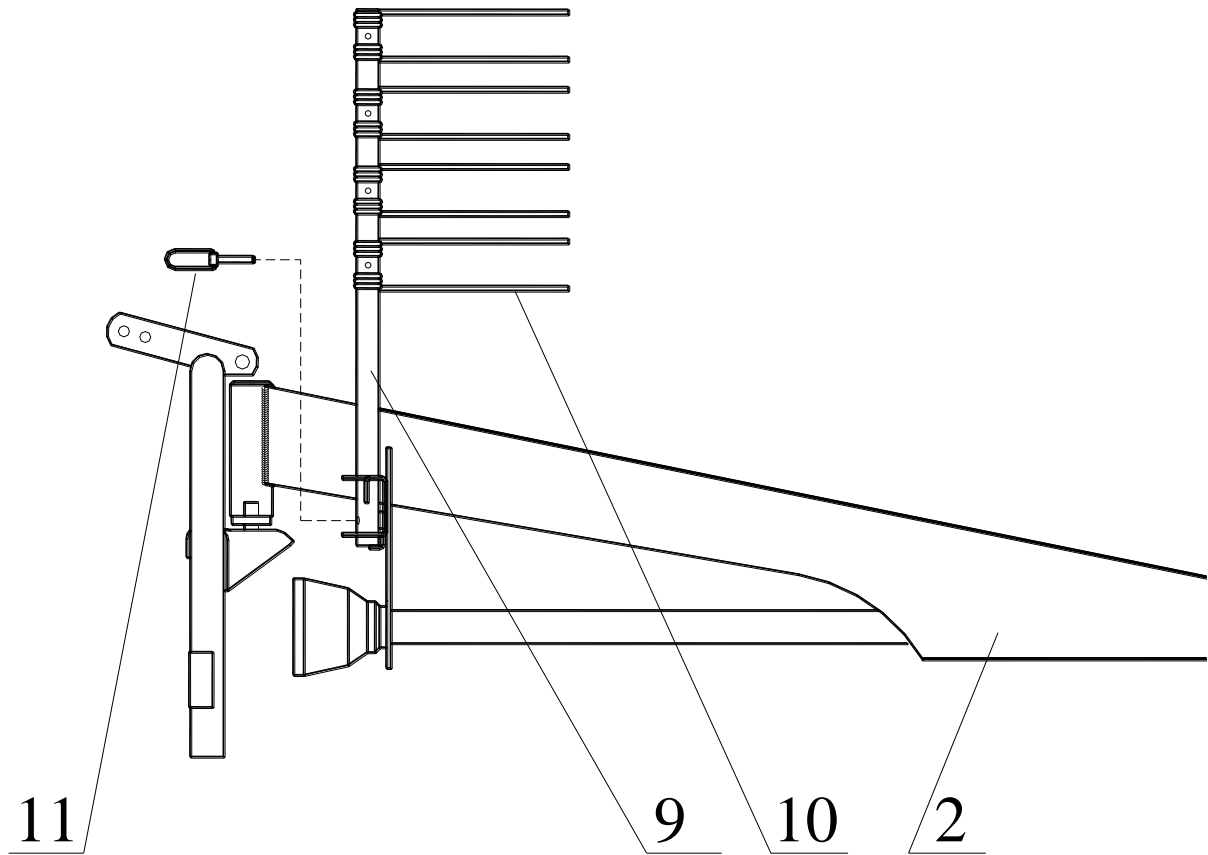


Fig. 6
 2 - Main frame,
 9 - End arm,
 10 - Teeth, 11 - Securing pin set
 12 - Central beam set., 14 - Screen,
 15 - Screen arm, 16 - Side arm,

4.2.3. PROTECTIVE YOKES SET TO WORK AND TRANSPORT

WORK POSITION

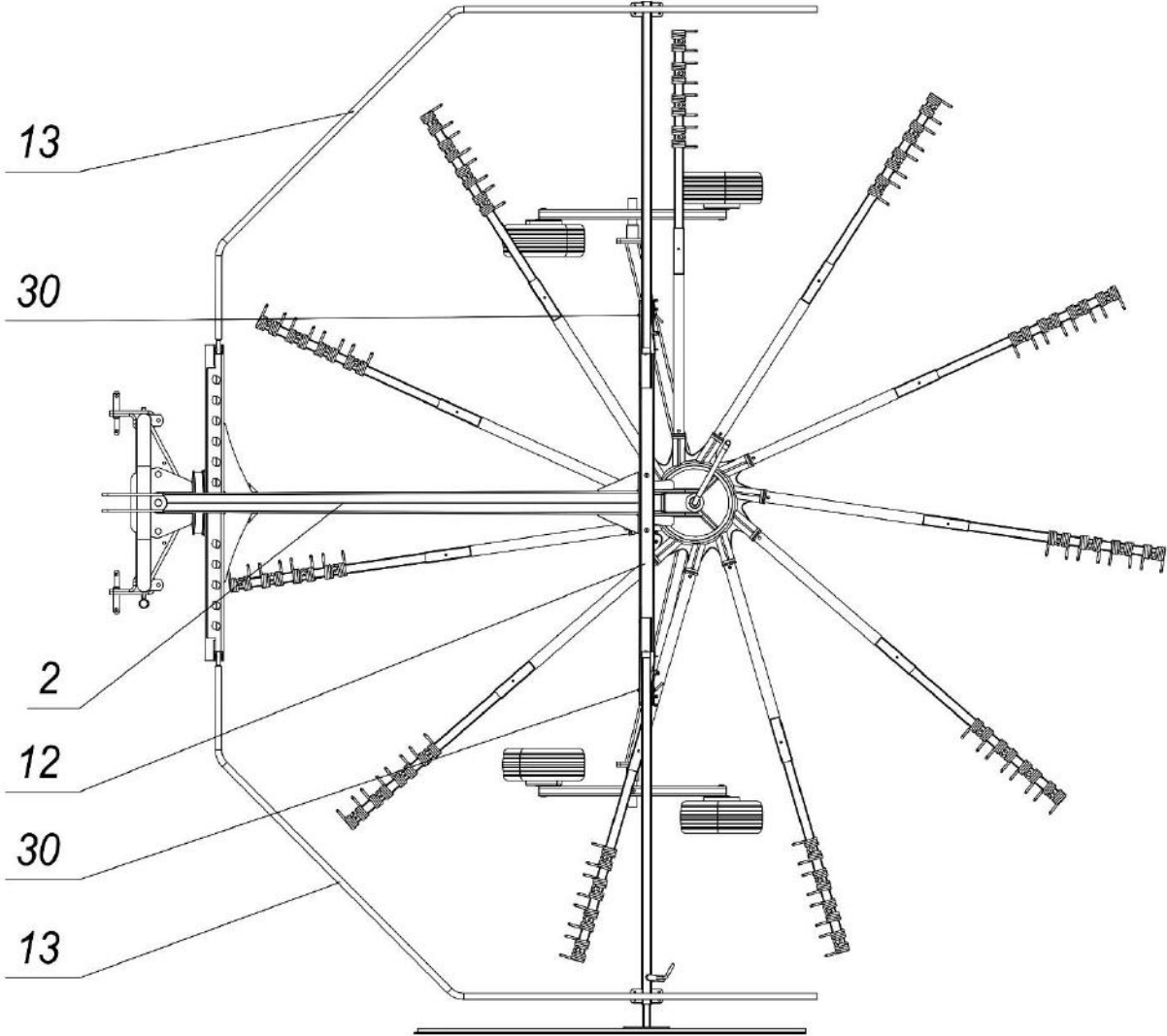


Fig. 7

2 – Main frame, 12 – Central beam set., 13 – Protective yokes, 30 – Securing pin with cotter

TRANSPORT POSITION

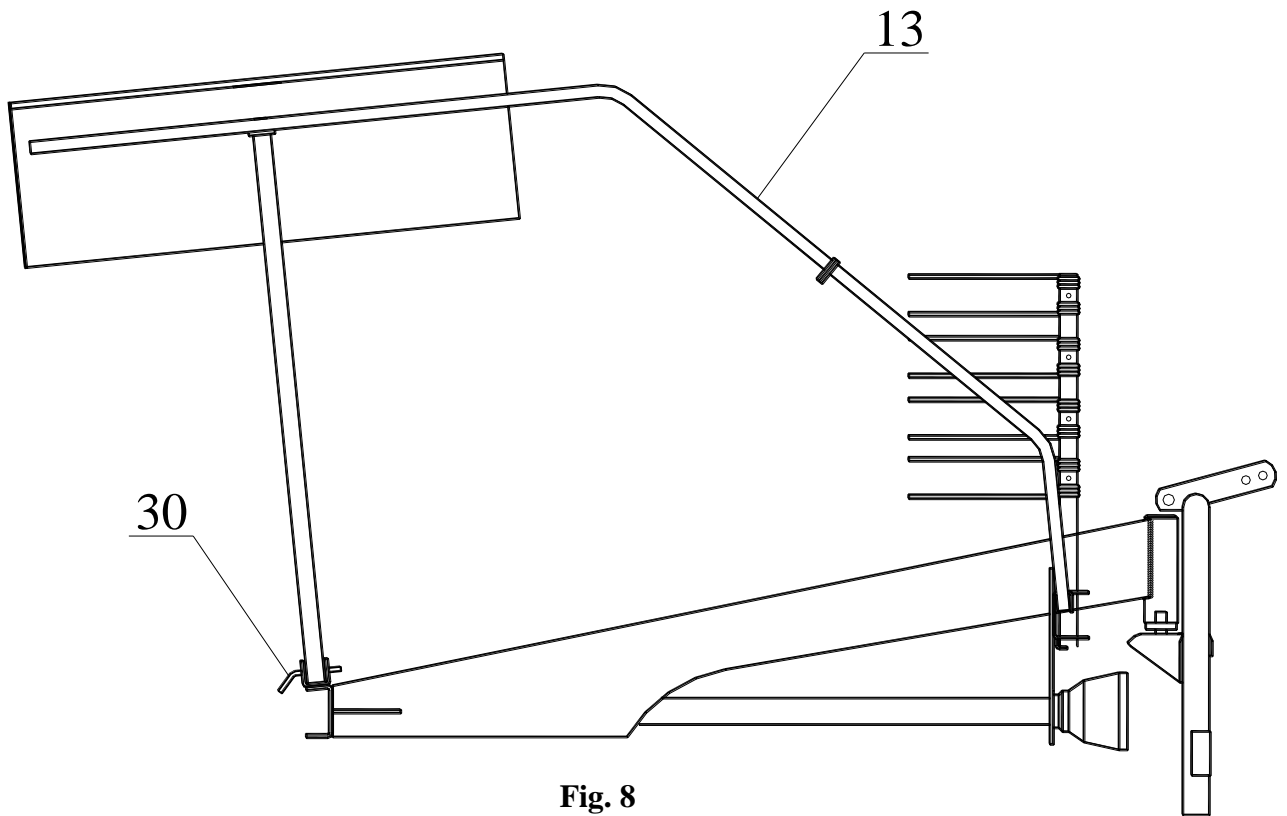


Fig. 8

13 – Protective yokes

After setting the protective yokes to transport or work position, always secure them with securing pin (fig. 7 and fig. 8 - item 30).

4.2.4. SETTING LATCH TO OPERATING POSITION AND TO TRANSPORTING POSITION

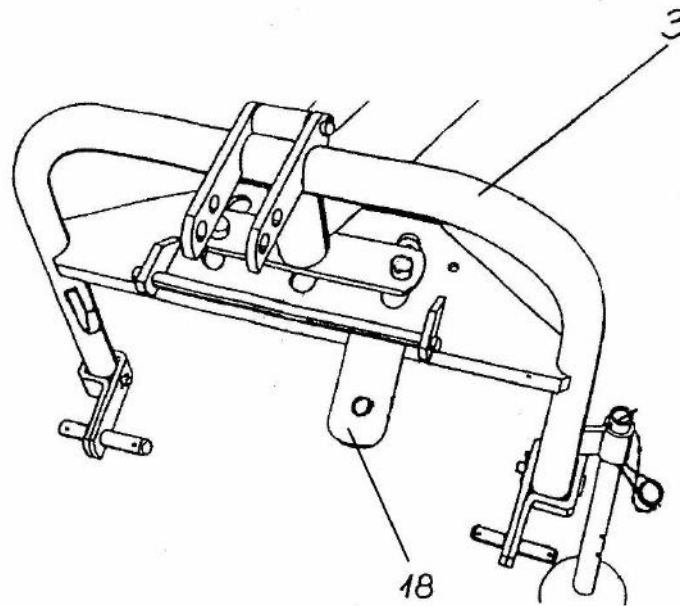


Fig. 9 Setting latch to operating position.

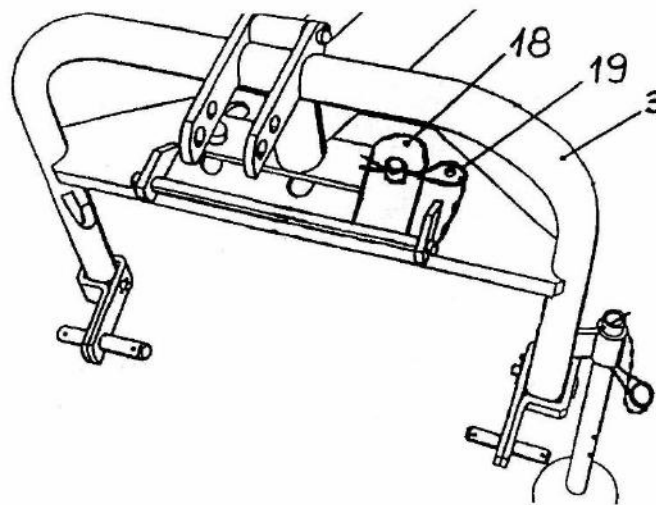


Fig. 10 Setting latch to transporting position.

3 – Three-point frame, 18- Latch, 19 - Cotter

Setting of latch 18 to operating position is presented in figure 9. In this state, the hay rake may perform limited sideways movement relative to tractor.

Setting latch 18 to transporting position is presented in figure 10.

The latch 18 hole, after the three point frame 3 reaches the bolt, blocks the hay rake sideways movement relative to tractor.

Latch 18 must be blocked with cotter 19 at all times in order to prevent the latch sliding out of the three point frame bolt.

4.2.5. SETTING HAY RAKE HEIGHT FOR TRANSPORT

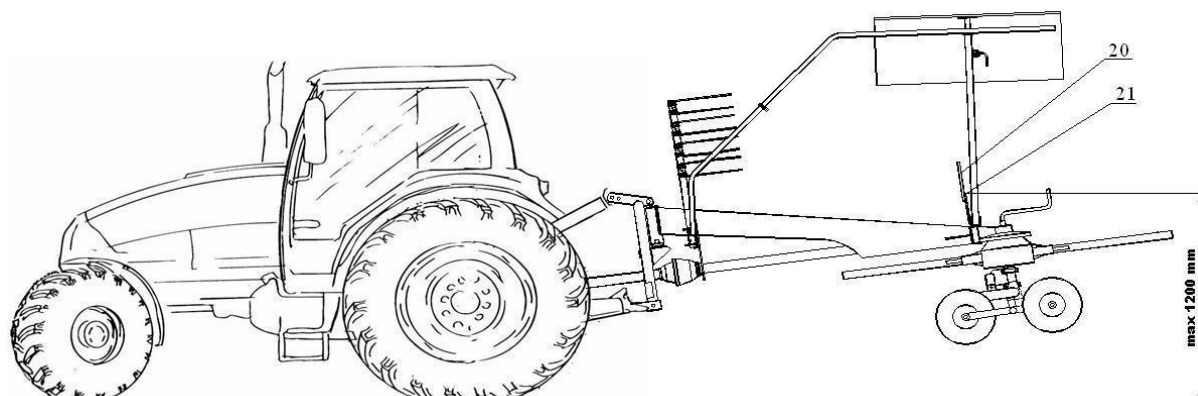


Fig. 11

- 20 - Mobile light and warning device,
- 21 - Red reflective lights.

Lift the hay rake suspended on the tractor to transporting position, as shown in figure 11, to such height that the distance of the upper edge of the light surface of the red reflective light from the road surface is max. 1200 mm.

4.2.6. SETTING LANDING LEG

Set landing leg 22 with cotter 23 in position for:

- transporting and operation - upper setting, as shown in figure 12
- standstill - lower setting, as shown on figure 13

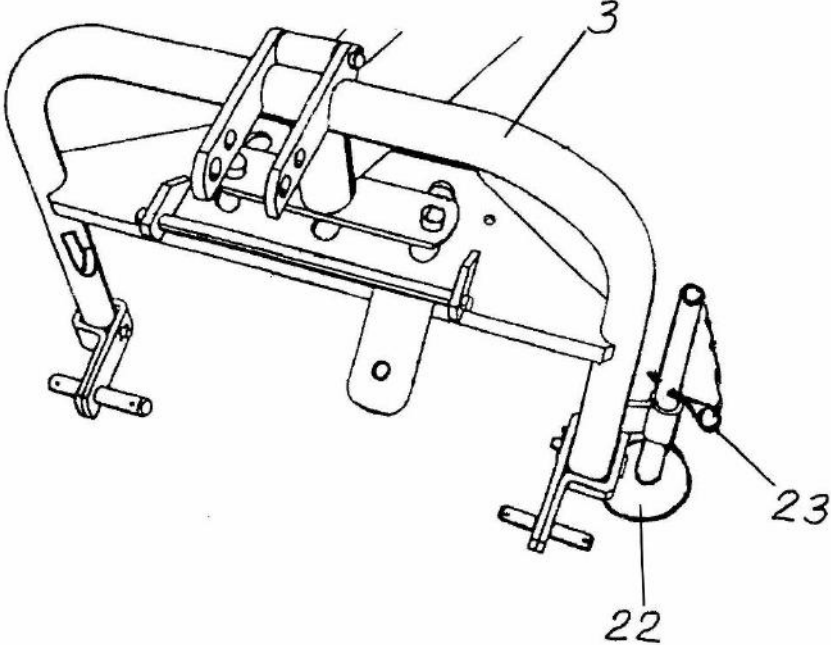


Fig. 12

3 - Main beam, 22 - Landing leg, 23 - Cotter

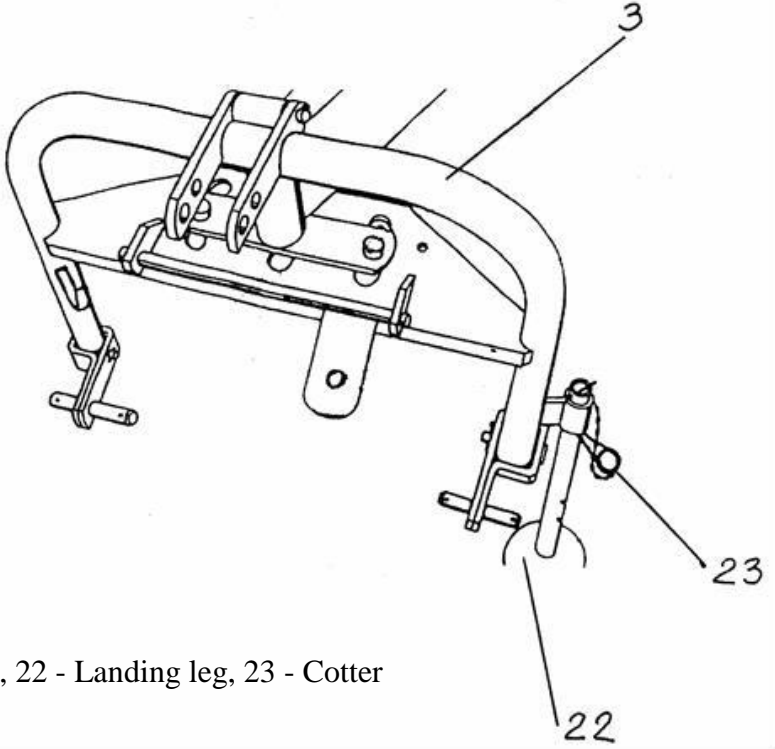


Fig. 13

3 - Main beam, 22 - Landing leg, 23 - Cotter

4.2.7. INSTALLATION OF MOBILE LIGHT AND WARNING DEVICE AND TRIANGULAR EMBLEM

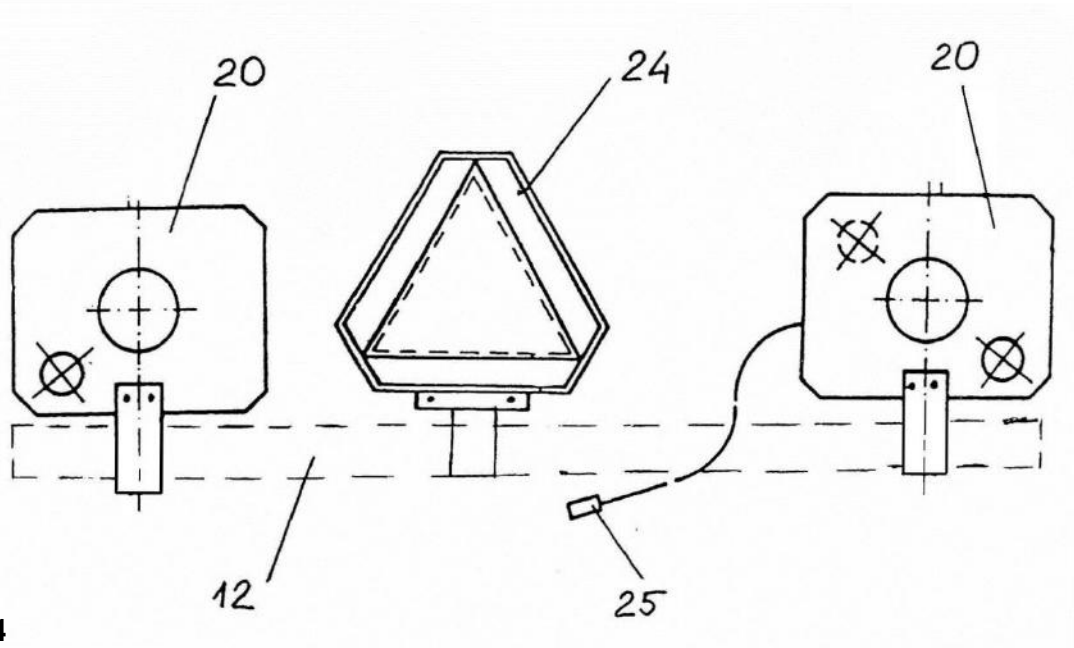


Fig. 14

12 - Central beam set, 20 - Mobile light and warning device,
24 - Triangular emblem, 25 - Cotter.

Install the mobile light and warning devices 20 and triangular emblem 24 as shown on figure 14.

Connect the plug 25 to electrical system socket of the tractor.

Make sure that the tractor and the mobile light and warning device lights operate simultaneously.

4.3. PREPARATION FOR TRANSPORTING

1. Set the end arms 9 as shown in figure 6.
2. Set the screen arm with screen 14 as shown in figure 6.
3. Set protective yoke 13 as shown in figure 8.
4. Set the pins of lower attachments of tractor three-point framing according to category II (figure 15).
5. Attach the rake to three-point linkage of the tractor according to the tractor's operating manual.



NOTE!

Maintain caution while attaching the hay rake to the tractor.

6. Install the triangle emblem 24 and the mobile light and warning device 20 as shown on figure 14, and check the lights operation.
7. Lift the hay rake with hydraulic jack to minimum height above the ground.

Maintain caution while lifting the hay rake with hydraulic jack.

- raise the landing leg 22 to upward position, as shown in figure 12
- set latch 18 to transporting position, as shown in figure 10

Make sure to insert cotter 19.

- set the tractor's three-point linkage central link length in such way that the distance of upper light surface of the red reflective light 21 on figure 11 from the driving surface is max. 1200 mm after lifting the hay rake to transporting position.

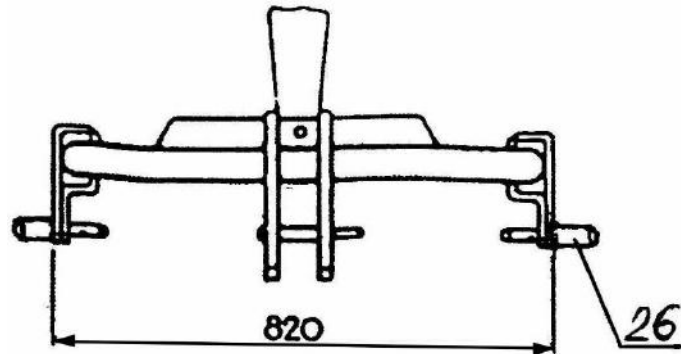


Fig.15 Spacing of pins of lower attachments of three-point frame, category II
26 – lower attachments

4.3.1. TRANSPORTING ON ROADS WITH HAY RAKE SUSPENDED

Make sure that the mobile light and warning device operates properly at all times.
Maintain caution while driving due to significant size of the hay rake.

4.4. PREPARING FOR WORK

Before each propelling of the raking arms of hay rake, make sure that there are no persons or animals standing within the range of the machine.

1. Set screen 14 with arm 15 and end arms 9 as shown on figure 5.
2. Set protective yoke 13 as shown on figure 7.
3. Set latch 18 to operating position, as shown on figure 9.
4. Check correct function of the hay rake by manually rotating the rotor.
The rotating arms must not collide with other elements while rotating.
The teeth performing raking action should be set at equal height from the ground.
Height adjustment is to be performed according to point 4.2.1.
5. Make sure that all settings and connections are performed properly.
6. Attach articulated telescopic shaft to hay rake and tractor, in accordance with the shaft operating manual.
Landing leg 22 should be set to upper setting, as shown on fig. 12.

4.4.1. WORKING WITH HAY RAKE

Before each propelling of the raking arms of hay rake, and during work, make sure that there are no persons or animals standing near the machine, or within the range of raking arms.

1. A correctly set hay rake rakes right beneath the raking teeth set to raking position, as shown on figures 16 and 17.
Raking teeth adjustment relative to field surface is to be performed according to point 4.2.1.

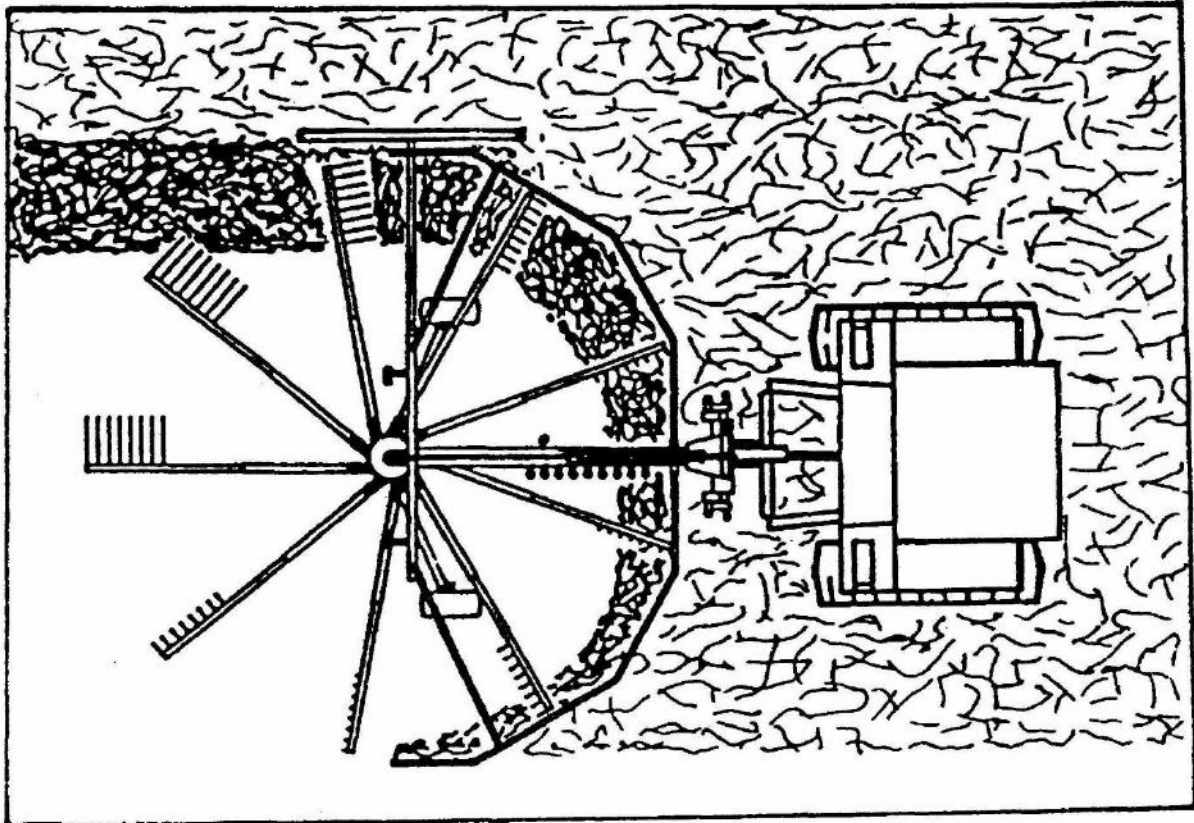


Fig. 16

2. Incorrect hay rake setting, as a result of:

- teeth set to excessive height over the field surface - causes the hay rake to leave an unraked crop at the entire working width, as shown in fig. 17.

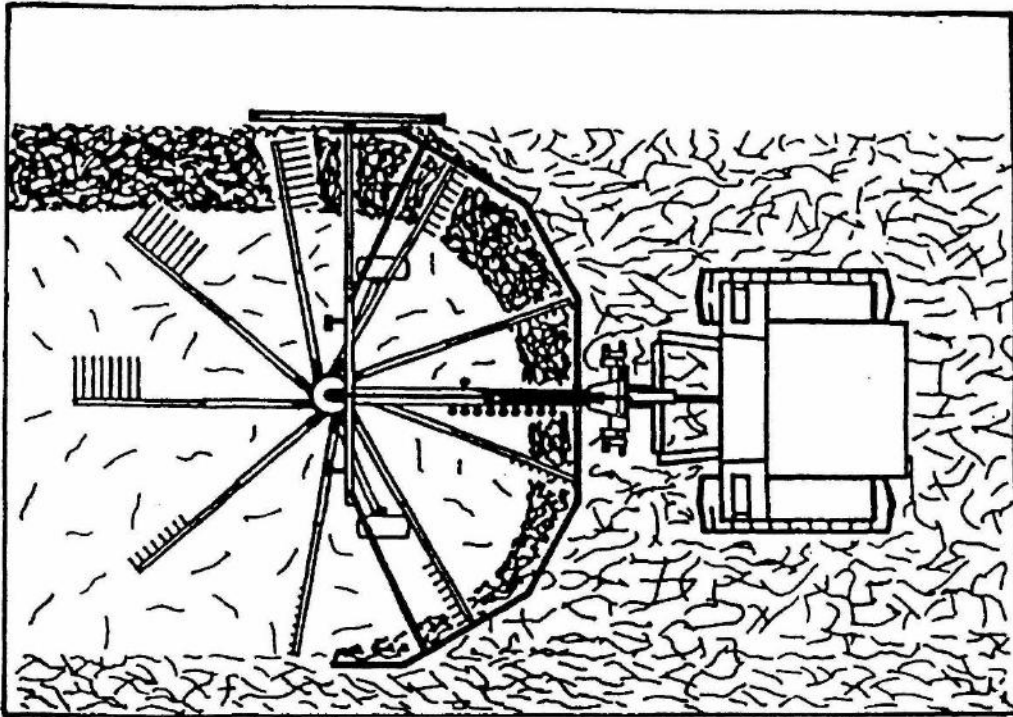


Fig. 17

- insufficient length of three-point linkage central link - causes the hay rake to leave crop at the edges of working width, as shown in figure 18.

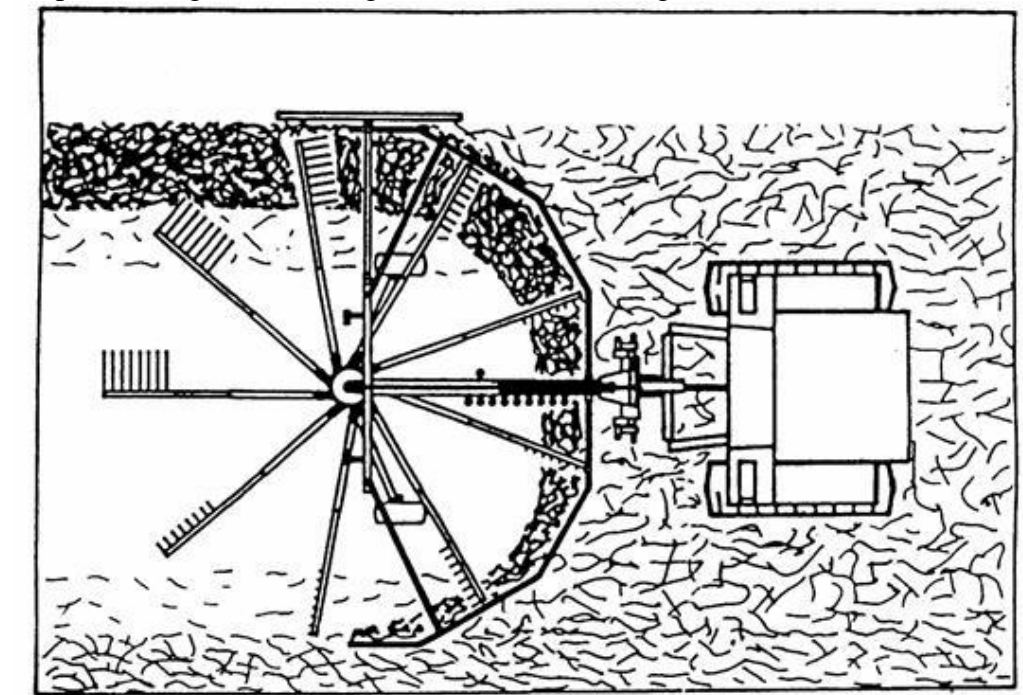


Fig. 18

- excessive length of three-point linkage central link - causes the hay rake to leave crop in the middle of working width, as shown in figure 19.

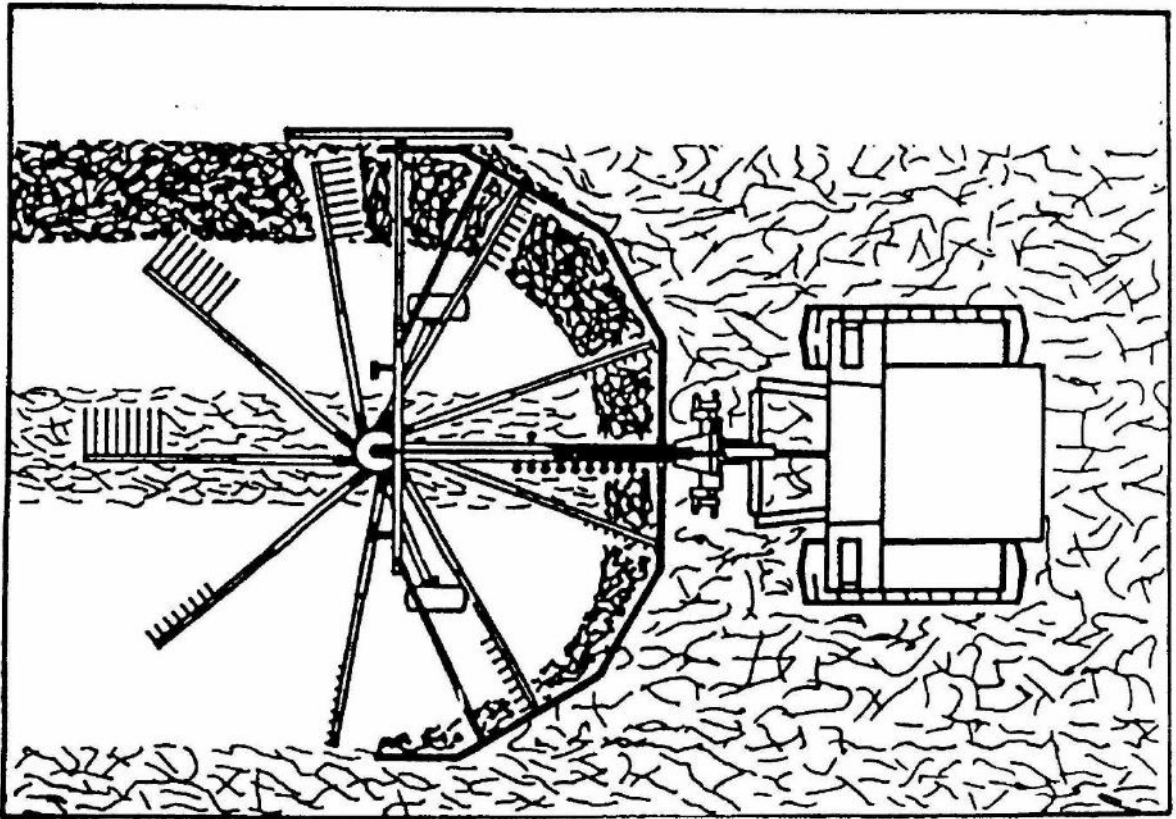


Fig. 19

4.5. PREPARING FOR PARKING AND DETACHING HAY RAKE FROM TRACTOR

Maintain caution while detaching the hay rake from the tractor.

1. The hay rake may be set to parking in transporting or in operating position.
2. Set the hay rake to minimum height above the ground.
3. Set the landing leg in parking position, as shown in figure 13.
4. Place the hay rake on the ground;
5. Decouple the articulated telescopic shaft from PTO of the tractor and place it in the holder of the three-point frame.
6. Disconnect the mobile lighting device cable from the tractor.
7. Disconnect tractor three-point linkage from the hay rake.

4.6. PARKING AND STORAGE OF HAY RAKE

Set the hay rake for parking and storage in such way that any risk to humans and animals is prevented.

Do not allow children to play near, or on the hay rake.

1. For prolonged storage, if the hay rake has not been placed on supports, relocate it once a month in such way that the point of contact of tires with the ground is changed. Parking and storage of the hay rake supported on deflated rubber wheels causes damage to inner tubes and tyres.

2. Check regularly that no signs of corrosion appear during storage; otherwise maintenance must be performed.

4.7. TECHNICAL SERVICE



WARNING

Before commencing maintenance or repair on the machine, stop the tractor engine, remove the keys from the ignition switch, place wedges on the driving wheels, apply parking brake and detach the articulated telescopic shaft.

Before disassembling elements required for maintaining the stability of the hay rake, provide additional support ensuring stability and protection from uncontrolled falling of individual assemblies.

1. While using the hay rake, inspect its technical condition at least once a day before beginning transport, and make sure that no grease is leaking from the gear's sealing rings.
2. Check that no signs of corrosion occur on the raking teeth. In case of corrosion, wipe the exposed areas with protective oil.
3. Regularly monitor air pressure in tires; it should be 0.17 MPa.
4. Clean the hay rake after every job, eliminate any faults identified, and replace worn elements with new ones whenever required.
5. In case of faulty operation of the hay rake and gear, or major damage, contact service point or dealership.
6. In case of necessity of replacing worn elements with new ones, use only genuine parts offered by the manufacturer of the hay rake, since only these parts guarantee the required quality of the machine.

Before purchasing replacement parts or raking teeth, always make sure that they are included in ZK 480 hay rake manufacturer's offer.

Before starting the agricultural season, and at least once a month within the hay rake operation period:

- inspect oil level in the gear, and top it up to the level of side plug 27 in the body (figure 20). In the case of noticing oil leak, eliminate the reason and replenish the oil up to the required level;
- inject 2 cm³ of Liten EPG-00 grease, or inject other grease to toothed gears.
- grease the joints of beams with supporting wheels using grease nipples 17 (Figure 2)
- grease the teeth ground clearance adjustment system through grease nipple 30 (Figure 20)

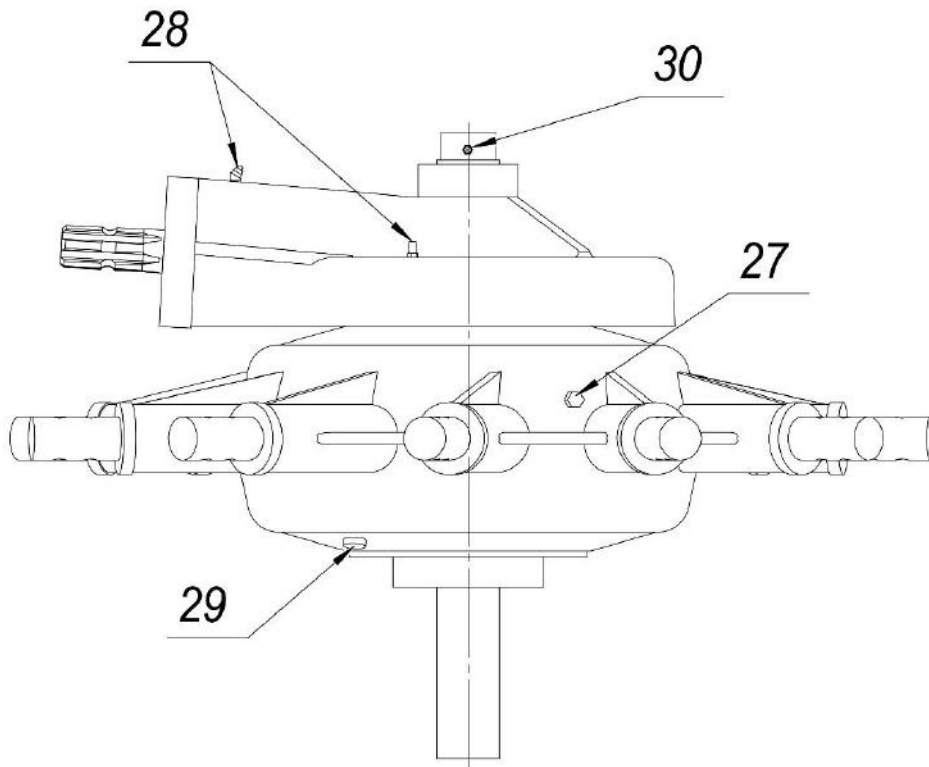


Fig. 20

27 – Side plug, 28 – Grease nipple, 29 – Drain plug, 30 – Grease nipple

4.8. REPAIR

Fault	Cause	Rectification
Oil leaking from gear	Damaged and/or worn sealing ring	Repair at service
Gear does not rotate	Faulty gear	Repair at service

5. TECHNICAL SPECIFICATION

1. Machine dimensions in parking and transporting configuration:
 - length 3 800 mm
 - width 2 600 mm
 - height 2 500 mm
- Machine dimensions in operating position:
 - length 4 600 mm
 - width 4 400 mm
 - height 1 250 mm
2. Weight 540 kg
3. Hay rake working width 4 800 mm
4. Rotor width 4 000 mm
5. Towing tractor parameters
 - suspension system category II
 - min. tractor class 0.6
6. PTO power requirements 29 kW
7. Number of double teeth 44 pcs.
8. Number of toothed gears 1 pc.
9. Maximum transporting speed 25 km/h
10. Machine working speed 6-10 km/h
11. Drive system
 - number of wheels: 4 pcs.
 - tyre pressure 0.17 Mpa
 - tire type 15 x 6.00 – 6 4 PR
12. Articulated telescopic shaft 45R-502-3-HA-P45B1
 - revolutions 540 RPM
 - transmitted torque 460 Nm
 - power 14 kW
 - nominal length 840 mm
 - clutch type - overload clutch type P45B1 with preset torque of 900 Nm.

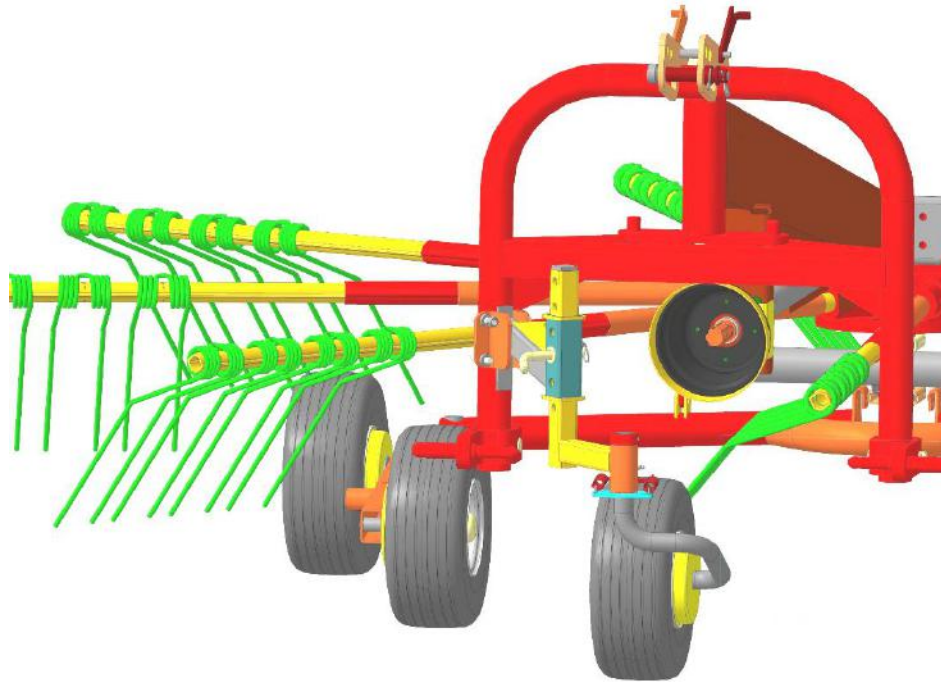
6. DISASSEMBLY AND DECOMMISSIONING.

In case of total wear of the hay rake, it may be submitted to a specialized unit dealing with disassembly and scrapping.

In case of deciding on individual disassembly, refer to the drawings and the parts list. Maintain particular caution while disassembling elements decisive for stability of the hay rake, and apply supports to prevent unexpected falling of certain parts of the hay rake.

7. ADDITIONAL EQUIPMENT

ZK 910.00.00 front following wheel for ZK 480 carousel hay rake



In order to prevent damaging turf on very uneven land, and to ensure precise collecting of swath, a front following wheel can be fitted, which is available as additional accessory.

Fitting to machine

Screw the front following wheel (item 4, page 46) arm using two U-shaped clamping rings (item 3, page 46) to the three-point frame pipe. The rotation protection welded to the three-point frame pipe must be placed between the angles of the front following wheel arm.

Working with tractor

Insert the included pin (item 2, page 44) with sleeve (item 8, page 44) used for connecting the three-point frame through the central link to the three-point suspension system of the tractor into the longitudinal openings in the three-point frame, and secure with cotter (item 6, page 44).

With the machine in lowered position, the pin must be located more or less in the middle of the longitudinal hole, so that the machine is able to cross uneven areas. While working, the safety latch (item 1 and 3, page 44) must be raised.

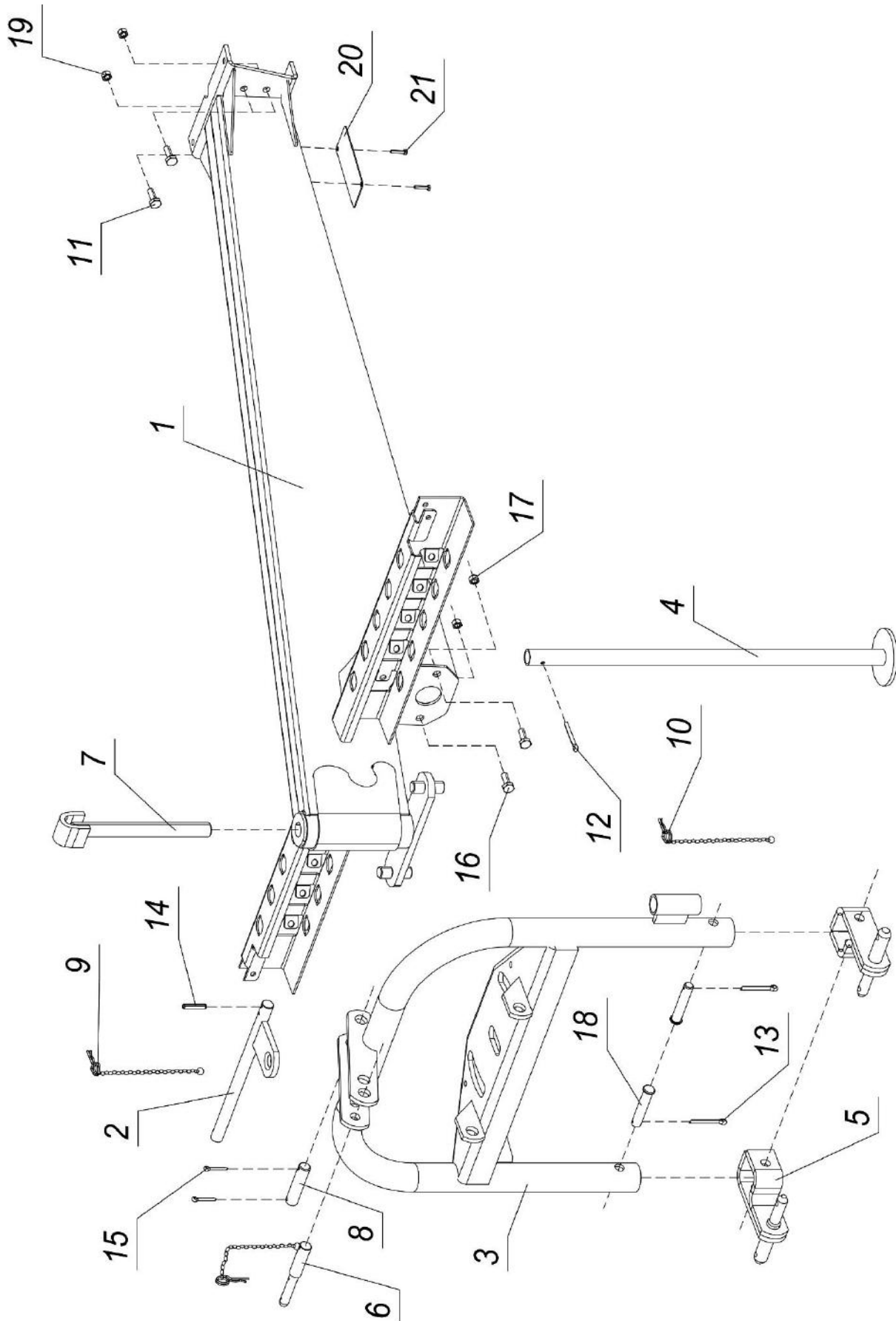
For transporting on public road, secure the pin by changing the position of safety latch (item 1 and 3, page 44).

Setting front following wheel height

Correct height setting of the front following wheel is performed with the use of holes in the front following wheel assembly (item 9, page 44), and with the use of securing pin set (item 5, page 46), which is to be secured with cotter (item 13, page 46) after inserting through the holes.

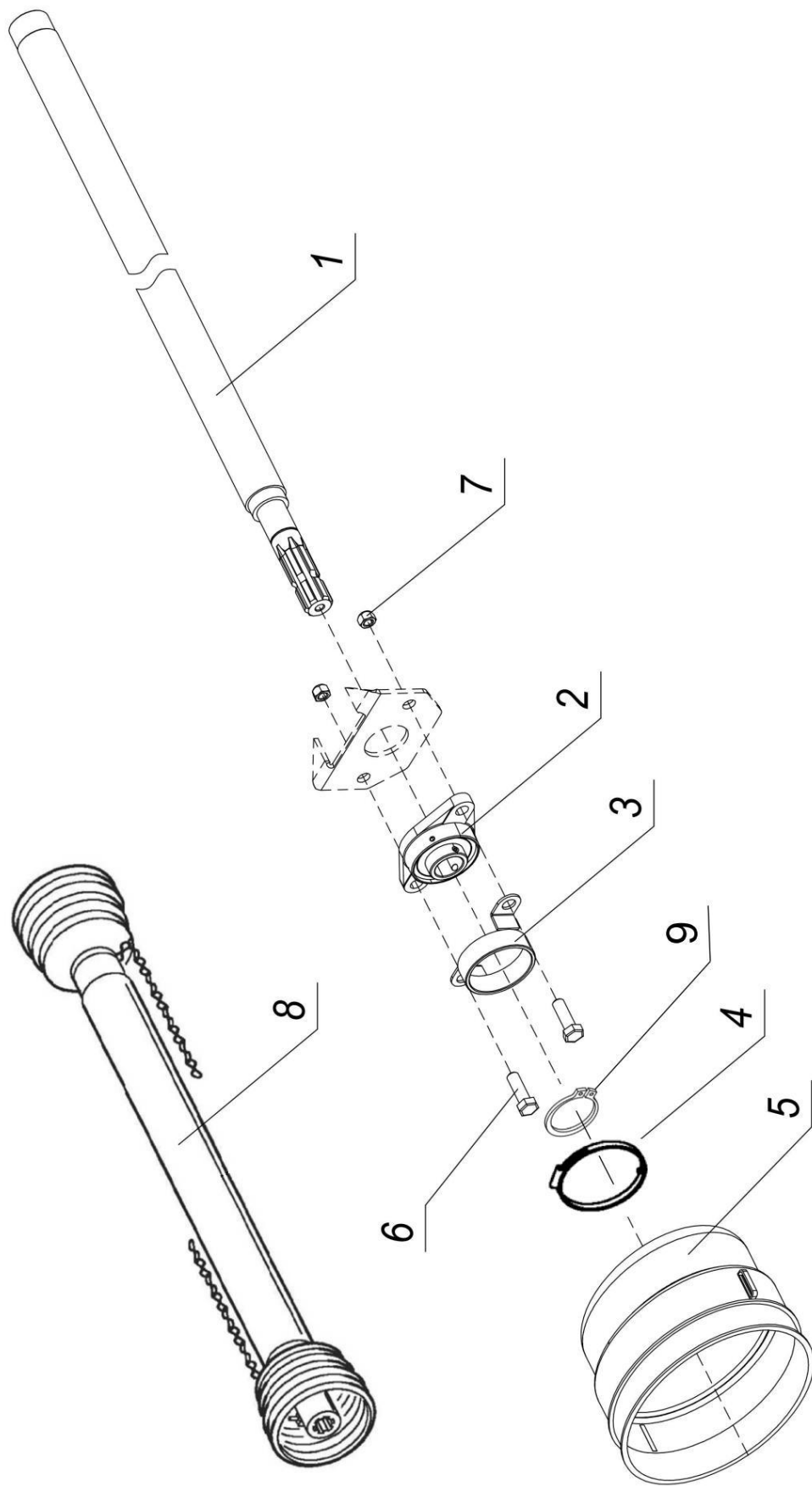
8. PARTS CATALOGUE

When ordering parts, specify their name, factory number, as well as manufacturing year and reference number of the machine.



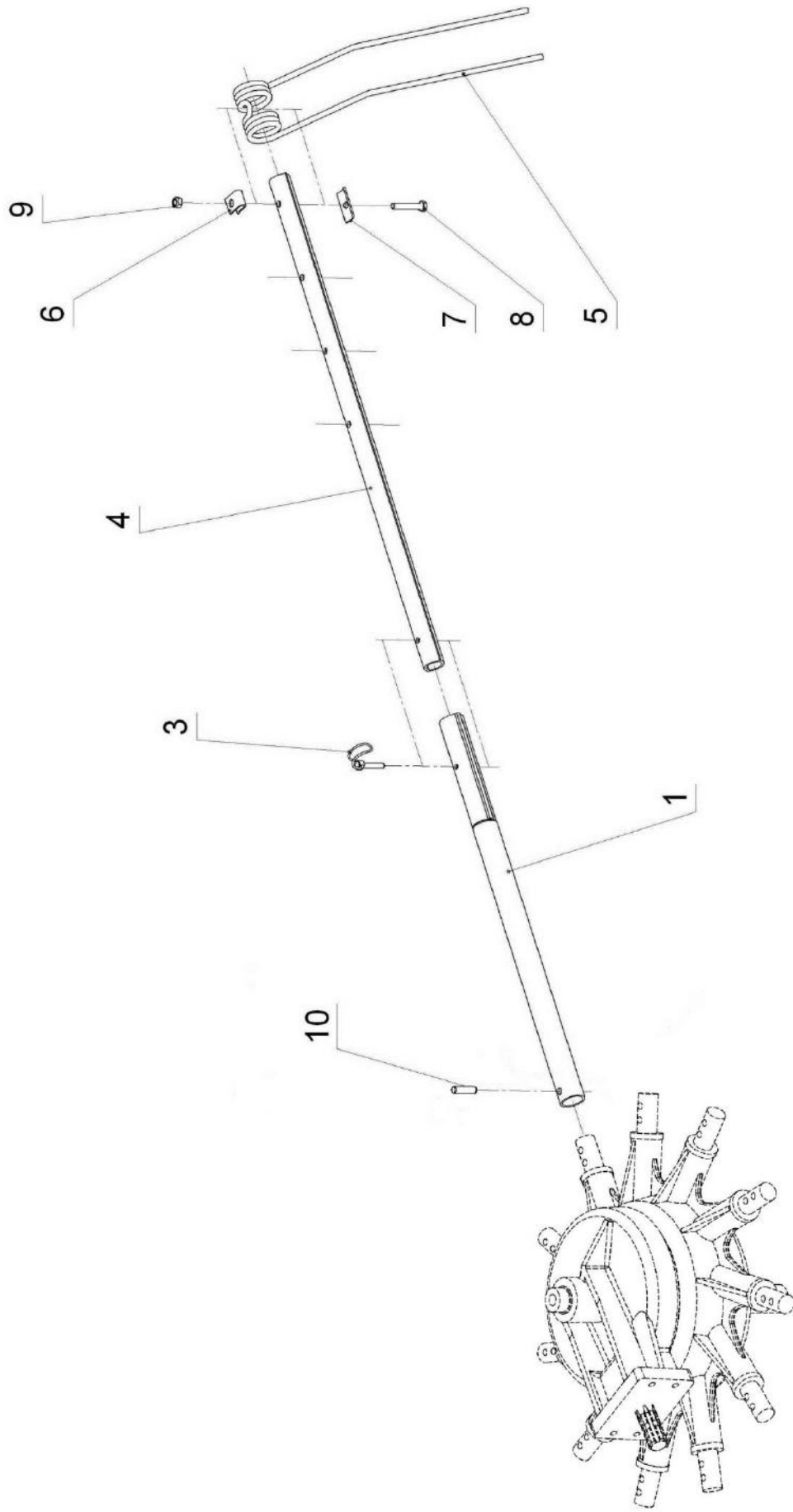
Main frame, set

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	Z 200.00.00	Welded intermediate frame	1	
2.	ZK-12.00.00	Latch, set	1	
3.	ZK-150.00.00	Welded three-point frame	1	
4.	HS 0200	Landing leg	1	
5.	HS 0188	Lower attachment set	2	
6.	HK 0028V	Mandrel, set	1	
7.	GZ 0281V	Bolt, set	1	
8.	GZ 283	Pin	1	
9.	ZK-14.00.00	Plug, set	1	
10.	PZ 00199V	Plug, set	1	
11.	PN-85/M-82105	Screw M14x45-8.8-A-Fe/Zn8cC	4	
12.	PN-76/M-82001	Cotter S-Zn8x63	1	
13.	PN-76/M-82001	Cotter S-Zn 5x36	2	
14.	PN-89/M-85023	Bolt 6x60	1	
15.	PN-76/M-82001	Cotter S-Zn 6.3x36	2	
16.	PN-85/M-82105	Screw M14x45-8.8-B-Fe	2	
17.	PN-88/M-82176	Nut P M14-8-B-Fe/Zn8cC	2	
18.	HS 182	Pin	2	
19.	PN-88/M-82176	Nut P M14-8-A-Fe/Zn8cC	4	
20.	ZK-110.00.06	Plate	1	
21.	DIN 7500 D	Forming screw M8x16-Fe/Zn8cC	2	



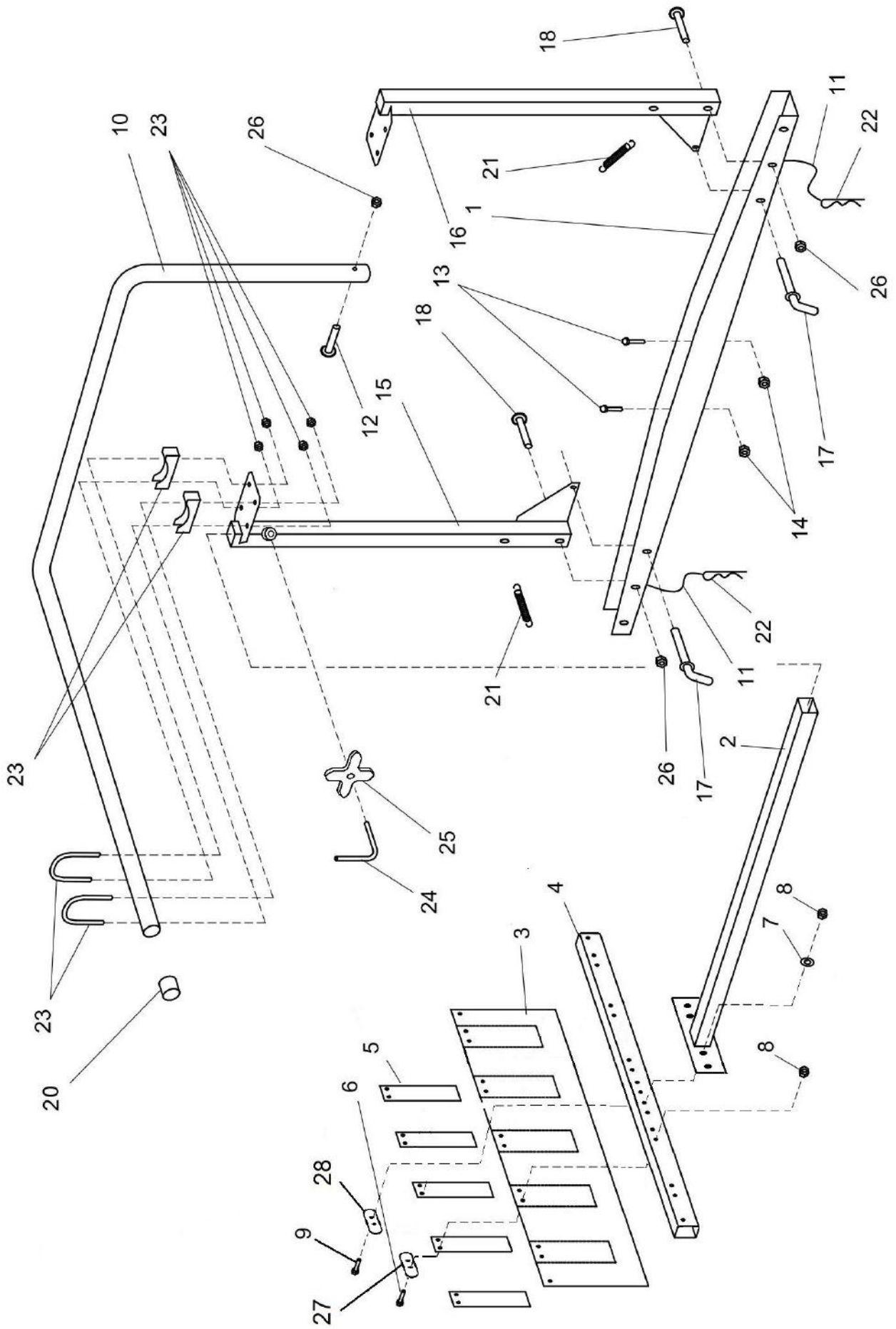
Intermediate shaft

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	Z 400.10.00	Welded pipe shaft	1	
2.	UCFL 207	Bearing assembly	1	
3.	Z 400.11.00	Welded bracing	1	
4.	AP 80 100	Band clip	1	
5.	NP. 0429	Shaft guard	1	
6.	PN-85/M-82105	Screw M14x45-8.8-A-Fe/Zn8cC	2	
7.	PN-86/M-82176	Nut P M14-8-B-Fe/Zn8cC	2	
8.	45R-502-3-HA-P45B1	Articulated telescopic shaft	1	
9.	ND 8008V	Spring ring Z 35x2	1	



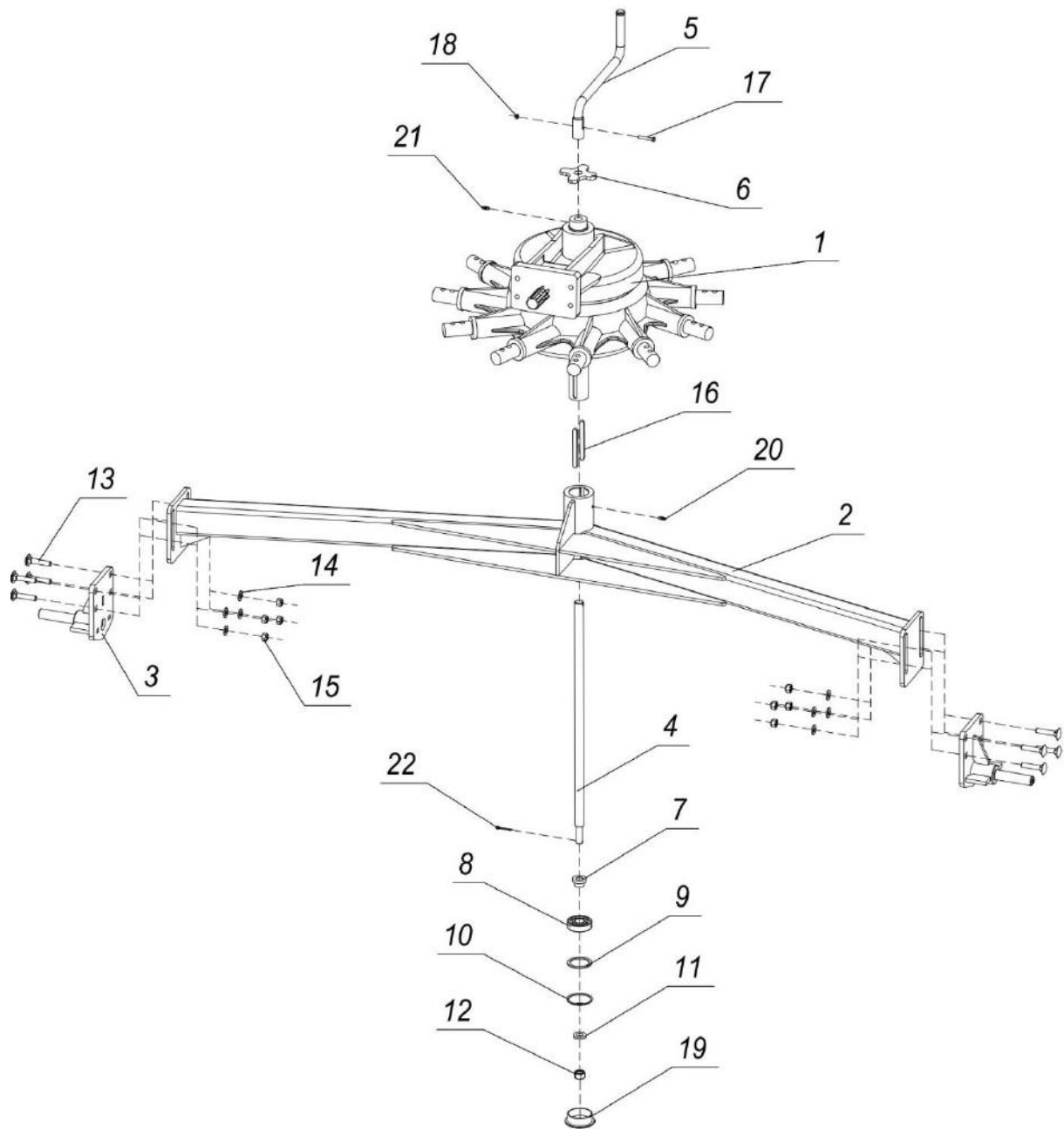
Raking arms

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	Z 300.20.00	Welded intermediate arm	11	
2.	PN-89/M-85023	Spring plug 6 x 45	11	
3.	ZK-30.30.00	Securing pin, set	11	
4.	ZK-30.20.01-3	End arm	11	
5.	Z 30.20.02	Tooth	44	
6.	ZK-30.20.03-4	Yoke	44	
7.	ZK-30.20.04-1	Cover plate	44	
8.	PN-85/M-82101	Screw M10x60-8.8-A-Fe/Zn8cC	44	
9.	PN-88/M-82176	Nut PM10-8-A-Fe/Zn8cC	44	
10.	PN-89/M-85023	Spring plug 12 x 45	11	



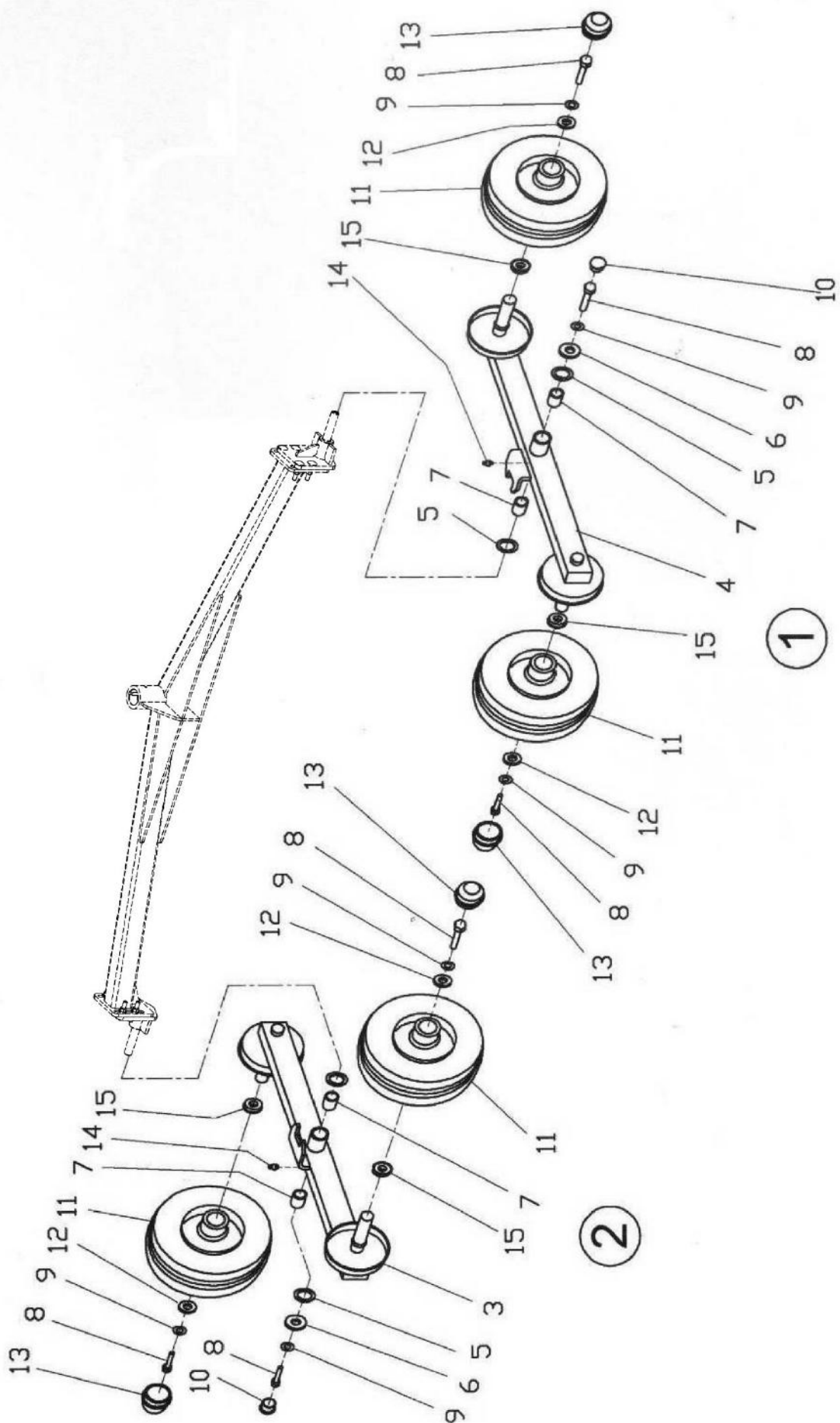
Beam system with protective yokes

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	Z 500.60.00	Welded middle beam	1	
2.	ZK 500.80.00	Screen arm, set	1	
3.	ZK 500.30.10	Apron	1	
4.	ZK 500.30.01	Beam	1	
5.	ZK 500.30.04	Bracing plate	5	
6.	PN-85/M-82105	Screw M6x35-8.8-B-Fe/Zn8cC	12	
7.	PN-79/M-82019	Washer B6.6-Fe/Zn9cC	12	
8.	PN-88/M-82176	Nut PM6-B-Fe/Zn8cC	12	
9.	PN-85/M-82105	Screw M8x40-8.8-B-Fe/Zn8cC	4	
10.	Z 500.40.00	Protective yoke	2	
11.	0656 4448	Rope	2	
12.	PN-85/M-82101	Screw M10x55-8.8-B-Fe/Zn8cC	2	
13.	PN-85/M-82302	Screw M10x25-8.8-B-Fe/Zn8cC	2	
14.	PN-88/M-82176	Nut PM10-8-B-Fe/Zn8cC	2	
15.	Z 500.71.00	Left arm, set	1	
16.	Z 500.70.00	Right arm, set	1	
17.	ZK-50.90.00	Welded pin	2	
18.	PN-85/M-82101	Screw M10x70-8.8-B-Fe/Zn8cC	2	
20.	MA 0280A	Plug	2	
21.	T2250V	Tension spring	2	
22.	NP 0448V	Cotter, single Ø3	2	
23.	NP 0447V	Pipe clamping ring UPC Ø28	4	
24.	ZK 500.00.01	Tightening screw	1	
25.	ZK 500.00.02	Plate	1	
26.	PN-88/M-82176	Nut P M10-8-B-Fe/Zn8cC	4	
27.	ZK 500.30.02	Shim	5	
28.	ZK 500.30.03	Shim	2	



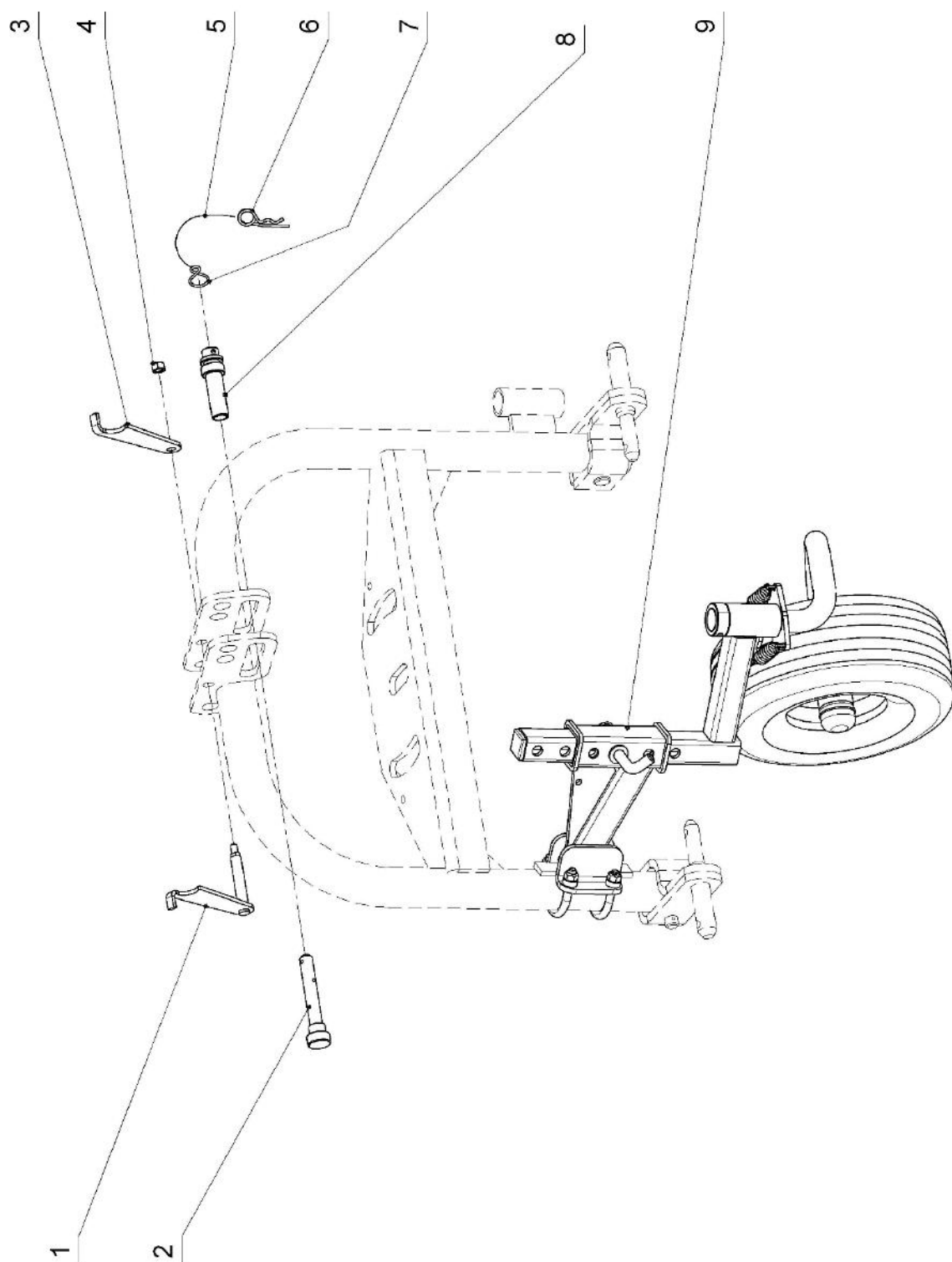
Driving wheels system

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	K – 792 A	Transmission	1	
2.	Z 600.41.00	Welded beam	1	
3.	Z 600.42.00	Welded wheel axle	2	
4.	Z 00.00.21	Adjustment screw	1	
5.	ZK-60.61.00	Crank	1	
6.	ZK 270.00.00.22	Holder	1	
7.	1660 6459	Sleeve	1	
8.	6305-2RS	Drive shaft	1	
9.	MT 63(15)	Washer 50x62x1,5	2	
10.	PN-81/M-85111	Seat spring ring W 62x2	1	
11.	NP 0493	Washer 17x32x5	1	
12.	PN-88/M-82148	Crown nut K M16-8-B-Fe/Zn8cC	1	
13.	PN-85/M-82406	Screw M12x40-8.8B-Fe/Zn8cC	8	
14.	0621 4206	Washer 13x30x4	8	
15.	PN-88/M-82176	Nut PM12-8-B-Fe/Zn8cC	8	
16.	ZK-00.00.06	Parallel key A10x7x110	2	
17.	PN-85/M-82101	Screw M6x40-8.8B-Fe/Zn8cC	1	
18.	PN-88/M-82176	Nut PM6-8-B-Fe/Zn8cC	1	
19.	NP 0495	Conical plug 65mm	1	
20.	01198225	grease nipple M8, self-threading	1	
21.	ND 9813V	grease nipple M8x1	1	
22.	PN-76/M-82001	Cotter S-Zn 4x25	1	



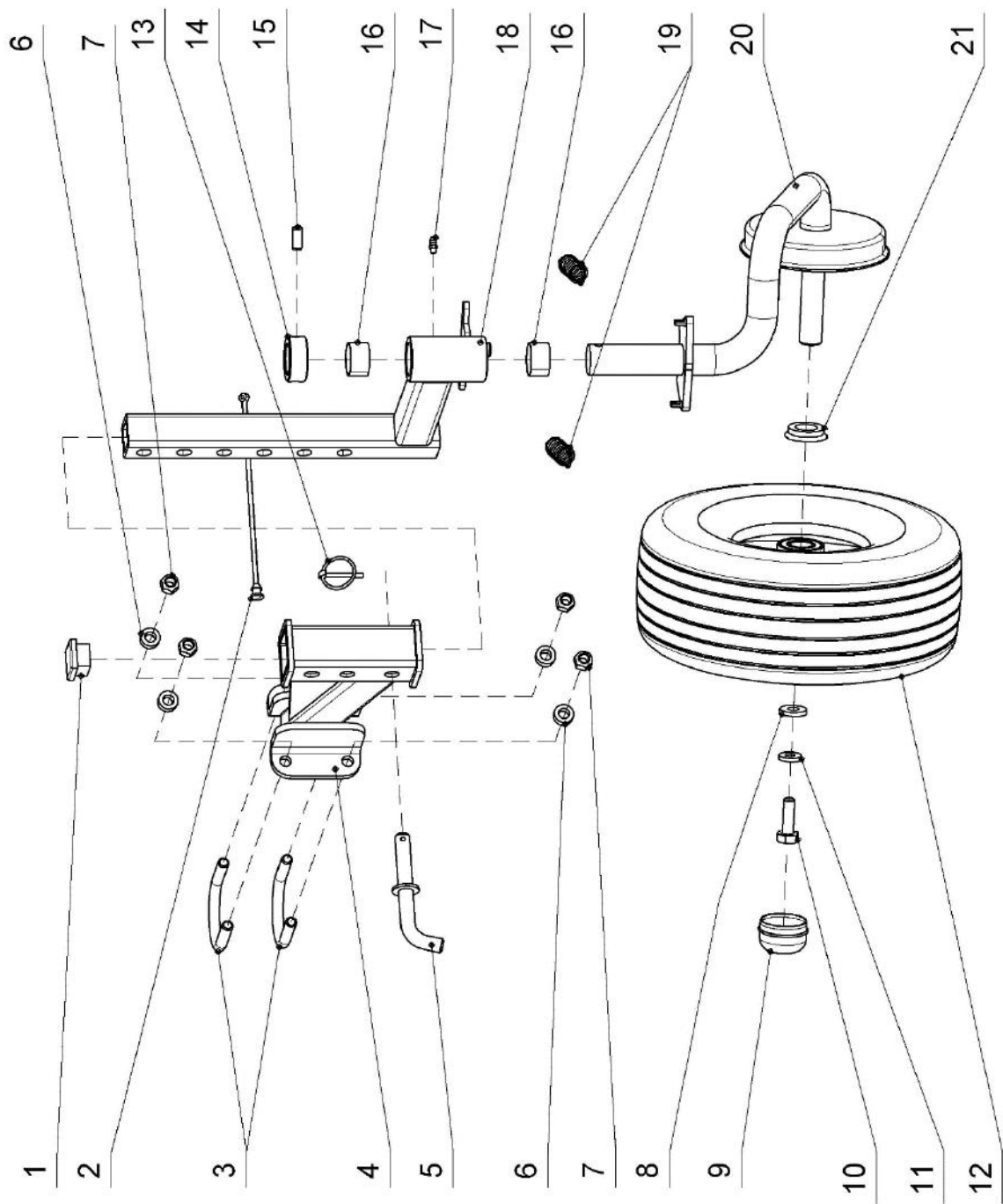
Tandem assembly

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	ZK 700.00.00	Left tandem	1	
2.	ZK 800.00.00	Right tandem	1	
3.	Z 700.00.00	Left beam, welded	1	
4.	Z 710.00.00	Right beam, welded	1	
5.	SF-10W26	Slide washer	4	
6.	ZK 700.00.02	Washer	2	
7.	SF-10-25-30	Slide sleeve	4	
8.	PN-85/M-82105	Screw M12x25-8.8-B-Fe/Zn8cC	6	
9.	PN-83/M-82037	Washer 13 Fe/Zn8cC	6	
10.	54D18A	Plug	2	
11.	ND 9841	Wheel, set 15x6.00-6 4 PR	4	
12.	TH 100V	Washer	4	
13.	ND 9620V	Plug	4	
14.	PN-76/M-86002	Grease nipple M6	2	
15.	TH 9	Sealing ring	4	



Front following wheel (additional equipment)

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	ZK 150.10.00	Welded latch	1	
2.	ZK 150.20.01	Pin	1	
3.	ZK 150.10.03	Left arm	1	
4.	PN-88/M-82176	Nut P M10-8-B-Fe/Zn8cC	1	
5.	ND 9734V	Linking chain	1	
6.	PZ 25V	Plug	1	
7.	ZK 150.00.03	Clasp	1	
8.	ZK 150.20.02	Sleeve	1	
9.	ZK 910.00.00	Front following wheel assembly	1	



Front following wheel (additional equipment)

Item	Part factory no.	Part or assembly name	Quantity	Notes
1.	NP 0482	Square plug 35x35	1	
2.	0656 4448	Rope	1	
3.	ZK 910.00.02	Clamping ring	2	
4.	ZK 910.20.00	Bracing assembly	1	
5.	ZK 910.40.00	Securing pin, set	1	
6.	ZK 910.00.01	Washer	4	
7.	PN-88/M-82176	Nut P M12-8-B-Fe/Zn8cC	4	
8.	TH 100	Washer 5x12.5x30	1	
9.	ND 9620V	Plug	1	
10.	PN-82/M-82105	Screw M12x25-8.8-B-Fe/Zn8cC	1	
11.	PN-83/M-82037	Washer 13 Fe/Zn8cC	1	
12.	ND 9841/A	Wheel, set 15x6.00-6 4 PR	1	
13.	DIN 11023	Cotter with ring 5x32	1	
14.	ZK 910.10.03	Ring	1	
15.	PN-89/M-85023	Spring stud 8x50	1	
16.	SF 10-34-20	Slide sleeve	2	
17.	PN-76/M-86002	Grease nipple M6	1	
18.	ZK 910.10.00	Adjustment unit	1	
19.	T1550	Spring	2	
20.	ZK 910.30.00	Welded wheel axle	1	
21.	TH 9	Sealing ring	1	

Notes