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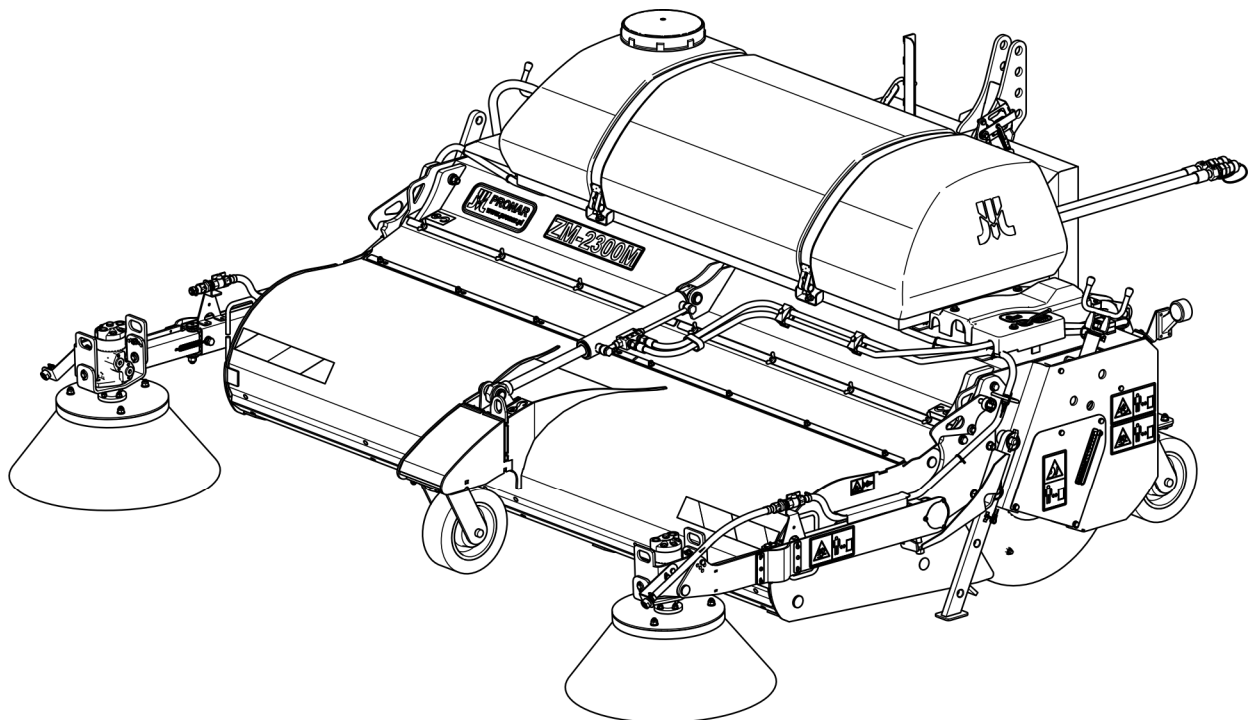
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OPERATOR'S MANUAL

TRACTOR ATTACHED SWEEPER

PRONAR ZM-2300M

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



EDITION 1A-03-2017

PUBLICATION NO 531N-0000000-UM



TRACTOR ATTACHED SWEEPER

PRONAR ZM-2300M

MACHINE IDENTIFICATION

TYPE: *ZM-2300M*

SERIAL NUMBER:

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INTRODUCTION

Information contained herein is current at date of publication. As a result of improvements, some numerical values and illustrations contained in this publication may not correspond to the factual specification of the machine supplied to the user. The manufacturer reserves the right to introduce design changes in machines produced that facilitate operation and improve the quality of their work, without making minor amendments to this Operator's Manual.

This Operator's Manual is an integral part of the machine's documentation. Before using the machine, the user must carefully read this Operator's Manual and observe all recommendations. This guarantees safe operation and ensures failure-free work of the machine. The machine is designed to meet obligatory standards, documents and legal regulations currently in force.

The manual describes the basic safety rules and operation of the machine. If the information stated in the Operator's Manual needs clarification then the user should refer for assistance to the sale point where the machine was purchased or to the Manufacturer.

MANUFACTURER'S ADDRESS:

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SYMBOLS APPEARING IN THIS OPERATOR'S MANUAL

Information, descriptions of danger and precautions and also recommendations and prohibitions associated with user safety instructions are marked:



and also preceded by the word "**DANGER**". Failure to observe the instructions may endanger the machine operator's or other person's health or life.

Particularly important information and instructions, the observance of which is essential, are distinguished in the text by the sign:



and also preceded by the word "**ATTENTION**". Failure to observe the instructions may lead to damage to the machine as a result of improper operation, adjustment or use.

In order to focus the user's attention on the need to perform maintenance, the relevant section of the Operator's Manual is marked with the pictogram:



Additional tips and advice for machine operation are marked with the sign:



and also preceded by the word "**TIP**".

DIRECTIONS USED IN THIS OPERATOR'S MANUAL

Left side – side to the left hand of the operator facing in the direction of machine's forward travel.

Right side – side to the right hand of the operator facing in the direction of machine's forward travel.



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EC DECLARATION OF CONFORMITY OF THE MACHINERY

PRONAR Sp. z o.o. declares with full responsibility, that the machine:

Description and identification of the machinery	
Generic denomination and function:	Tractor attached sweeper
Type:	ZM-2300M
Model:	—
Serial number:	
Commercial name:	Tractor attached sweeper PRONAR ZM-2300M

to which this declaration relates, fulfills all the relevant provisions of the Directive **2006/42/EC** of The European Parliament and of The Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (Official Journal of the EU, L 157/24 of 09.06.2006).

The person authorized to compile the technical file is the Head of Research and Development Department at PRONAR Sp. z o.o., 17-210 Narew, ul. Mickiewicza 101A, Poland.

This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

Narew, the 2017-03-28

Place and date

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członek zarządu

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SECTION

1

**BASIC
INFORMATION**

1.1 IDENTIFICATION

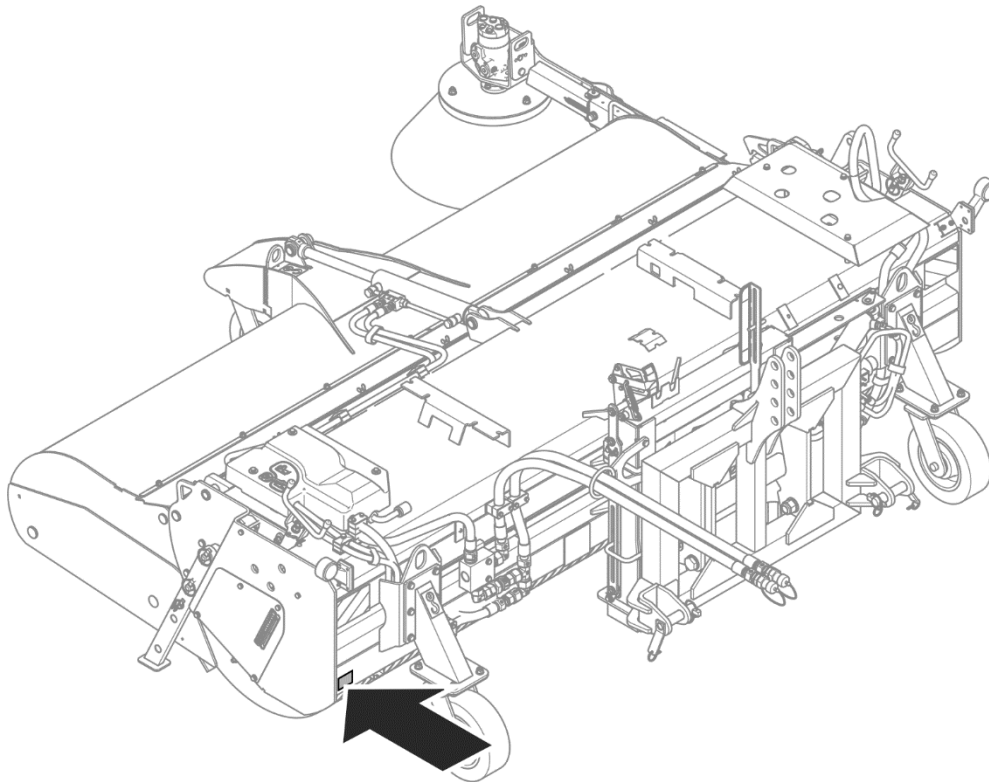
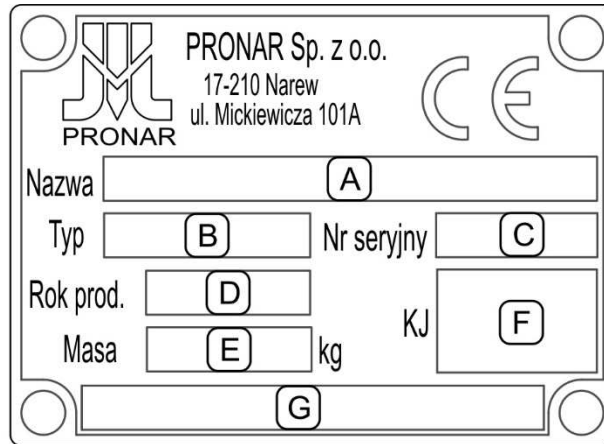


FIGURE 1.1 Location of the data plate

Meaning of data plate items (FIGURE 1.1):

- A - machine name
- B – type
- C – serial number
- D – year of manufacture
- E – machine tare weight [kg]
- F – Quality Control stamp
- G – additional information

Serial number is stamped on the data plate. The sweeper's data plate is located on the frame next to the left support wheel. (FIGURE 1.1).

When buying the machine, confirm that the serial number on the machine corresponds to the number indicated in the *WARRANTY BOOK*, in the sales documents and in the *OPERATOR'S MANUAL*.

1.2 PROPER USE

ZM-2300M mounted sweeper is used for keeping clean access roads, parking spaces, squares, external surroundings of buildings with paved surfaces made of asphalt, concrete paving blocks, concrete. The sweeper may be used by road maintenance services for technological cleaning of the roadbed prior to application of asphalt layer on renovated road sections. With the waste tank raised or without the waste tank, the sweeper can be used for sweeping dirt or a thin, fresh layer of snow to the right or left without actually collecting the swept materials.

Depending on its equipment, the sweeper can be mounted on the front of the carrying vehicles that meet the requirements set out in table 1.1.

Using it as intended also involves all actions connected with the safe and proper operation and maintenance of the machine. Due to the above, the user is obliged to:

- carefully read the *OPERATOR'S MANUAL* and comply with its recommendations,
- understand the machine's operating principle and how to operate it safely and correctly,
- comply with general safety regulations while working,
- prevent accidents,
- comply with road traffic regulations.

The machine may only be used by persons, who:

- are familiar with the contents of this publication and with the contents of the carrying vehicle's *Operator's Manual*,
- have been trained in machine operation and safe working conditions,
- have the required authorisation to drive the vehicle and are familiar with the road traffic regulations and transport regulations.

ATTENTION

The machine must not be used for purposes other than those for which it is intended, in particular for:

- for transporting people and animals,
- for transport of whatever objects on the machine

TABLE 1.1 Carrying vehicle requirements

	UNIT	REQUIREMENTS
Hydraulic system		
Nominal pressure	MPa	16
Type of oil	-	hydraulic, HL32
Number and position of hydraulic connectors	-	two sockets of one hydraulic section with the continuous operation function, installed on the front of the carrying vehicle
Type of hydraulic couplings*:		
- for the hydraulic system with the output below 90 l/min	-	mushroom sockets, size 12.5 series A ISO 7241-1
- for the hydraulic system with the output above 90 l/min	-	mushroom sockets, size 20 series A ISO 7241-1
Hydraulic system capacity (<i>minimum / maximum</i>)	l/min	40 / 140
Electrical system		
Type of connection	-	3-pole socket
Electrical system voltage	V	12
Linkage*		
Front three point linkage	-	cat. II according to ISO 730-1
other	-	forklift truck, EURO front loader
Mounting method	-	compatible with the sweeper's mounting system
Lifting capacity of three-point linkage (<i>at the distance of 610 mm</i>)	kg	3 300

* - depending on the machine version

1.3 EQUIPMENT

The standard equipment of the sweeper includes:

- sweeper with mechanical turning system,
- right side brush to choose from (hard, medium, soft),
- sprinkler system
- roller brush to choose from (very hard, hard, medium, soft),
- category II three-point linkage
- hydraulic system for outputs below 90 l/min,
- Operator's Manual,
- Warranty Book,

Additional fittings and optional equipment:

- left side brush to choose from (hard, medium, soft),
- hydraulic turning system,
- hydraulic system for outputs above 90 l/min
- linkage for forklift truck or another linkage system,
- without sprinkler system,
- without waste tank,
- without side brushes,
- two side brushes

1.4 WARRANTY TERMS

PRONAR Sp. z o.o. Narew guarantees the reliable operation of the machine when it is used according to its intended purpose as described in the *OPERATOR'S MANUAL*. Defects discovered during the warranty period will be removed by the Warranty Service. The repair period is specified in the *WARRANTY BOOK*.

The guarantee does not apply to those parts and sub-assemblies of the machine, which are subject to wear in normal usage conditions, regardless of the warranty period. Consumables include the following parts/sub-assemblies:

- working elements of the roller brush and side brush,
- sealing strip under the waste tank,
- support wheels,
- protective coatings in contact with contaminations, brush bristle and hitching points,
- bearings, filters, fuses,
- roller brush guides.

The warranty service only applies to such cases as: mechanical damage which is not the user's fault, factory defects of parts, etc.

In the event of damage arising from:

- mechanical damage which is the user's fault, road accidents,
- inappropriate use, adjustment or maintenance, use of the machine for purposes other than those for which it is intended,
- use of damaged or malfunctioning machine,
- repairs carried out by unauthorised persons, repairs carried out improperly,
- making unauthorised alterations to machine design,

the user will lose the right to warranty service.

**TIP**

Demand that the seller carefully and precisely fills out the *WARRANTY BOOK* and guarantee repair coupons. A missing date of purchase or sale point stamp, may make the user ineligible for any warranty repair or refund.

The user is obliged to report immediately on noticing any wear in the paint coating or traces of corrosion, and to have the faults rectified whether they are covered by the guarantee or not. For detailed Terms & Conditions of Warranty, please refer to the *WARRANTY BOOK* attached to each newly purchased machine.

Modification of the machine without the written consent of the Manufacturer is forbidden. In particular, do NOT weld, drill holes in, cut or heat the main structural elements, which have a direct impact on the machine operation safety.

1.5 TRANSPORT

The machine is prepared for sale completely assembled and does not require packing. Packing is only required for the machine operator's manual and electrical system components.

Delivery is either by transport on a vehicle or independently, after being attached to a tractor. Transport of the machine is permissible connected to a carrying vehicle provided the vehicle's driver familiarises himself with the machine's Operator's Manual and particularly with information concerning safety and principles of connection and transport on public roads.

During road transport the machine should be firmly secured on the load platform by means of certified belts or chains fitted with a tightening mechanism.

When loading and unloading the machine, comply with the general principles of workplace health and safety for reloading work. Persons operating reloading equipment must have the qualifications required to operate these machines.

The machine should be attached to lifting equipment in places specially designed for this purpose (FIGURE 1.2), i.e. by the lugs on the sweeper's frame and the lug on the front support wheel bracket.

Suspension points are identified with information decals. When lifting the machine take particular care due to the possibility of tipping over the machine and the risk of injuries from protruding parts. To keep lifted machine in the correct direction it is recommended to apply additional guy ropes. During the loading work particular care should be taken not to damage paint coating.

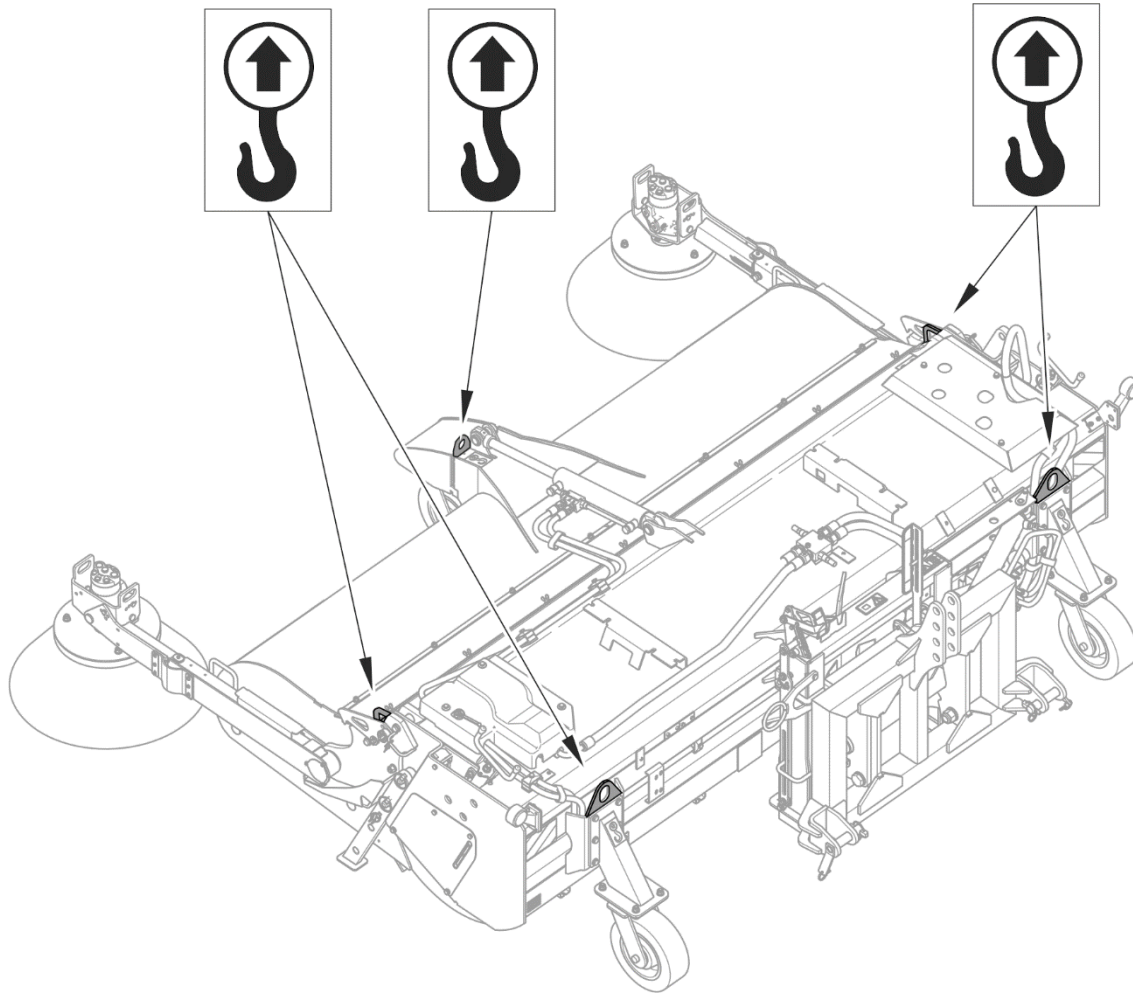


FIGURE 1.2 Transport suspension points

DANGER



When transporting independently, the user must carefully read this Operator's Manual and observe all recommendations. When being transported on a motor vehicle the machine must be mounted on the vehicle's platform in accordance with the transport safety requirements. The driver of the vehicle should take particular care while transporting the machine. This is due to the vehicle's centre of gravity shifting upwards when loaded with the machine.

ATTENTION



Do NOT secure lifting slings or any types of load securing elements to side brush arm, hydraulic cylinders, electrical system components and fragile elements of the machine (e.g. shields, conduits).

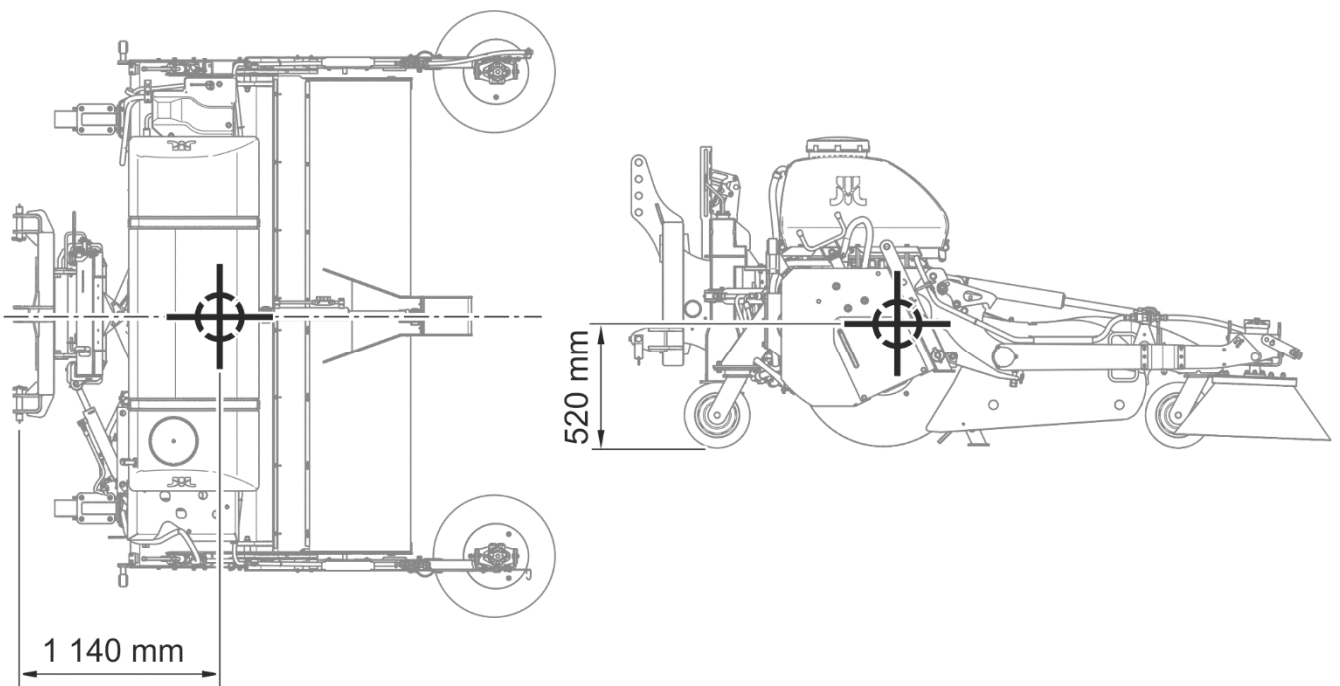


FIGURE 1.3 Centre of gravity

Dimensions on the drawing are given in millimetres [mm] for the sweeper equipped with two side brushes, waste tank and sprinkler system with empty water tank.



ATTENTION

Depending on the machine version, location of centre of gravity varies in the range of ± 100 mm

1.6 ENVIRONMENTAL HAZARDS

A hydraulic oil leak constitutes a direct threat to the natural environment owing to its limited biodegradability. Maintenance and repair work which involves the risk of an oil leak should be performed in the rooms with oil resistant surface. In the event of oil leaking into the environment, first of all contain the source of the leak, and then collect the leaked oil using available means. Remaining oil should be collected using sorbents, or by mixing the oil with sand, sawdust or other absorbent materials. The oil contaminations, once gathered up, should be kept in a sealed, marked, hydrocarbon resistant container, and then passed on to the appropriate oil waste recycling centre. The container should be kept away from heat sources, flammable materials and food.

Oil, which has been used up or is unsuitable for further use owing to a loss of its properties should be stored in its original packaging in the conditions described above.

1.7 WITHDRAWAL FROM USE

In the event of decision by the user to withdraw the machine from use, comply with the regulations in force in the given country concerning withdrawal from use and recycling of machines withdrawn from use.



ATTENTION

During dismantling, personal protection equipment shall be used i.e. protective clothing, boots, gloves and protective goggles etc.

Avoid contact of skin with oil. Do not allow used oil to spill.

Before proceeding to dismantle machine, oil shall be completely removed from hydraulic system.

When spare parts are changed, worn out or damaged parts should be taken to a collection point for recyclable raw materials. Used oil and also rubber and plastic elements should be taken to the appropriate facilities dealing with the recycling of this type of waste.

SECTION

2

**SAFETY
ADVICE**

2.1 BASIC SAFETY RULES

2.1.1 USE OF MACHINE

- Before using the machine, the user must carefully read this Operator's Manual and the *WARRANTY BOOK*. When operating the machine, the operator must comply with all recommendations contained in the Operator's Manual.
- The machine may only be used and operated by persons qualified to drive carrying vehicle and trained in the use of the machine.
- If the information in this Operator's Manual is difficult to understand, contact the dealer, who runs an manufacturer authorised service, or contact the manufacturer directly.
- Careless and improper use and operation of the machine, and non-compliance with the recommendations given in this operator's manual is dangerous to your health.
- Be aware of the existence of a residual risk, and for this reason the fundamental basis for using this machine should be the application of safety rules and sensible behaviour.
- The machine must never be used by persons, who are not authorised to drive carrying vehicle, including children and people under the influence of alcohol or other drugs.
- The machine must not be used for purposes other than those for which it is intended. Anyone who uses the machine other than the way intended takes full responsibility for himself for any consequences of this use. Use of the machine for purposes other than those for which it is intended by the Manufacturer may invalidate the guarantee.
- The machine may only be used when all the protective elements (e.g. shields) and warning markings are technically sound and correctly positioned. In the event of loss or destruction of the safety guards, they must be replaced with new ones.

2.1.2 HITCHING AND UNHITCHING FROM CARRYING VEHICLE

- Do NOT hitch the machine to a carrying vehicle, if the linkage system of the machine is not compatible with the linkage system of the carrying vehicle.

- After completed hitching of the machine, check the safeguards. Carefully read the carrying vehicle Operator's Manual.
- To hitch the machine to the carrying vehicle use only linking elements recommended by the Manufacturer.
- The carrying vehicle to which the machine will be hitched must be technically reliable and must fulfil the requirements specified by the machine Manufacturer.
- Be especially careful when hitching the machine to carrying vehicle.
- When hitching, there must be nobody between the machine and the carrying vehicle.
- Be especially careful when unhitching the machine from the carrying vehicle.
- The machine disconnected from the carrying vehicle must be supported on wheels and parking stands, set on a level, sufficiently hard surface in such a way as to allow re-connecting.

2.1.3 HYDRAULIC SYSTEM

- The hydraulic system is under high pressure when operating.
- Regularly check the technical condition of the connections and the hydraulic conduits. There must be no oil leaks.
- In the event of the hydraulic system malfunction, discontinue using the machine until the malfunction is corrected.
- When connecting or disconnecting the hydraulic conduits, make sure that carrying vehicle and machine hydraulic system is not under pressure. If necessary reduce residual pressure in the system.
- Use the hydraulic oil recommended by the Manufacturer. Never mix two types of oil.
- In the event of injuries being caused by pressurised hydraulic oil, contact a doctor immediately. Hydraulic oil may find its way under the skin and cause infections. In the event of contact of oil with eye, rinse with large quantity of water and in the event of the occurrence of irritation consult a doctor. In the event of contact of oil with skin wash the area of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene).

- Used oil or oil which has lost its properties should be stored in original containers or replacement containers resistant to action of hydrocarbons. Replacement containers must be clearly marked and appropriately stored.
- Do not store hydraulic oil in packaging designed for storing food or foodstuffs.
- Hydraulic conduits must be changed every 4 years regardless of their technical condition.
- Repair and replacement of hydraulic system elements should be entrusted to the appropriately qualified persons.

2.1.4 TRANSPORTING THE MACHINE

- Before driving on public roads, check operation of indicator lights.
- When driving on public roads, comply with the road traffic regulations in force in the country, in which the machine is used.
- Do not exceed the permitted speed arising from road conditions and design limitations. Adjust travel speed to the prevailing road conditions and other limitations arising from road traffic regulations limits.
- Do NOT leave the machine raised and unsecured while the carrying vehicle is parked. When parked, the machine should be lowered.
- Do NOT ride on the machine or transport any materials on it.
- Before using the machine always check its technical condition, especially in terms of safety. In particular, check the technical condition of the linkage and elements connecting hydraulic system.
- When driving with raised machine, the carrying vehicle's linkage should be locked in the up position to prevent its accidental lowering (*if it is possible*)
- Reckless driving and excessive speed may cause accidents.

2.1.5 MAINTENANCE

- During the warranty period, any repairs may only be carried out by Service authorised by the manufacturer. It is recommended that necessary repairs to machine should be undertaken by specialised workshops.

- In the event of any fault or damage whatsoever, do not use the machine until the fault has been corrected.
- During work, use the proper, close-fitting protective clothing, gloves and appropriate tools. When working on hydraulic systems it is recommended to use oil resistant gloves and protective goggles.
- Any modification to the machine frees PRONAR from any responsibility for damage or detriment to health which may arise as a result.
- Regularly check the technical condition of the safety devices and correct tightening of bolt connections.
- Regularly perform service inspections of machine as recommended by the Manufacturer.
- Servicing and repair work should be carried out in line with the general principles of workplace health and safety. In the event of injury, the wound must be immediately cleaned and disinfected. In the event of more serious injuries, seek a doctor's advice.
- Repair, maintenance and cleaning work should be carried out with the carrying vehicle's engine turned off and the ignition key removed. Immobilise the carrying vehicle with parking brake and ensure that unauthorised persons do not have access to the vehicle's cab.
- Should it be necessary to change individual parts, use only original parts. Non-adherence to these requirements may put the user and other people's health and life at risk, and also damage the machine and invalidate the warranty.
- Regularly check technical condition and mounting of all guards and protective elements.
- Do NOT weld, drill holes in, cut or heat the main structural elements, which have a direct impact on the machine operation safety.
- In the event of work requiring the machine to be raised, use properly certified hoists or lifting devices. After lifting the machine, stable and durable supports must also be used. Do NOT perform service or repair work under raised and unsupported machine.

- The machine must not be supported using fragile elements (bricks or concrete blocks).
- After completing work associated with lubrication, remove excess oil or grease.
- In order to reduce the danger of fire the machine must be kept in a clean condition.

2.1.6 MACHINE OPERATION

- Before starting the carrying vehicle with the hitched machine, make sure that the control levers of the external hydraulic system are not engaged, otherwise, the machine may be started in an uncontrolled manner.
- Before activating the machine, always ensure that all the safety guards are in good condition and in place.
- Before lifting or lowering the machine mounted on the carrying vehicle, make sure that there are no bystanders near the machine.
- Before starting the machine make sure that there are no bystanders (especially children) or animals in the danger zone. The operator is obliged to ensure proper visibility of the machine and the working area.
- During machine operation do not occupy a different position than that of the operator in the vehicle's cab. Do NOT leave the cab, when the machine is in operation.
- Keep a safe distance from rotating machine parts.
- When filling the water tank, the machine should be lowered to working position and the carrying vehicle's engine should be turned off.

2.2 RESIDUAL RISK

Pronar Sp. z o. o. in Narew has made every effort to eliminate the risk of accidents. There is, however, a certain residual risk, which could lead to an accident, and this is connected mainly with the actions described below:

- using the machine for purposes other than those for which it is intended,

- being between the carrying vehicle and the machine while the engine is running and when the machine is being attached,
- being on the machine while the engine is running,
- operating the machine with removed or faulty safety guards,
- not maintaining safe distance from the danger zone or being within the zones while the machine is operating,
- operation of the machine by persons under the influence of alcohol,
- cleaning, maintenance and technical checks when the carrying vehicle is connected and its engine is running,
- damage to hydraulic conduits.

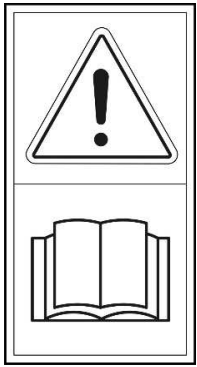




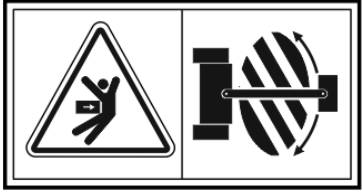
The minimal risk may be kept to a minimum by following the recommendations below:

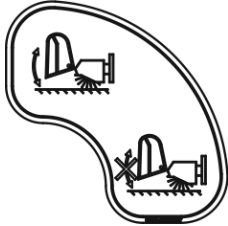
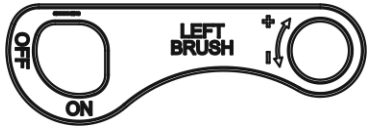







- operate the machine in prudent and unhurried manner,
- reasonably apply all the remarks and recommendations stated in the Operator's Manual,
- carry out repair and maintenance work in line with operating safety rules,
- repair and maintenance work should be carried out by persons trained to do so,
- use close fitting protective clothing,
- ensure unauthorised persons have no access to the machine, especially children,
- maintain a safe distance from forbidden or dangerous places
- do not climb on the machine when it is operating

2.3 INFORMATION AND WARNING DECALS

All signs should always be legible and clean, visible to the operator and also to persons possibly being in the vicinity of the machine in operation. If any safety sign is lost or illegible, it should be replaced with a new one. All elements having safety signs replaced during repairs should be affixed with these signs. Safety signs and decals may be purchased from the Manufacturer or the Seller.

TABLE 2.1 Information and warning decals

ITEM	SYMBOL	DESCRIPTION
1		<p>Before starting work, carefully read the Operator's Manual.</p>
2		<p>Pressurised liquid. Keep a safe distance.</p>
3		<p>Risk of injury caused by thrown objects. Keep a safe distance from the operating machine.</p>
4		<p>Do NOT approach and do NOT touch rotating brushes</p>
5		<p>Do not reach into crushing space because elements may move. Danger of crushing hands or fingers</p>
6		<p>There must be no bystanders within the machine working zone. If any work is required in these areas, make sure the carrying vehicle is stationary, and whether the implement is disconnected from the power source.</p>

ITEM	SYMBOL	DESCRIPTION
7		Waste tank rising interlock
8		Left brush control
9		Right brush control
10		Marking of points of suspension
11		Front clearance marking
12		Rear clearance marking
13		Brush height indicator
14		Sweeper model
15		Manufacturer's marking

Numbers in the item column correspond to marking (FIGURE 2.1)

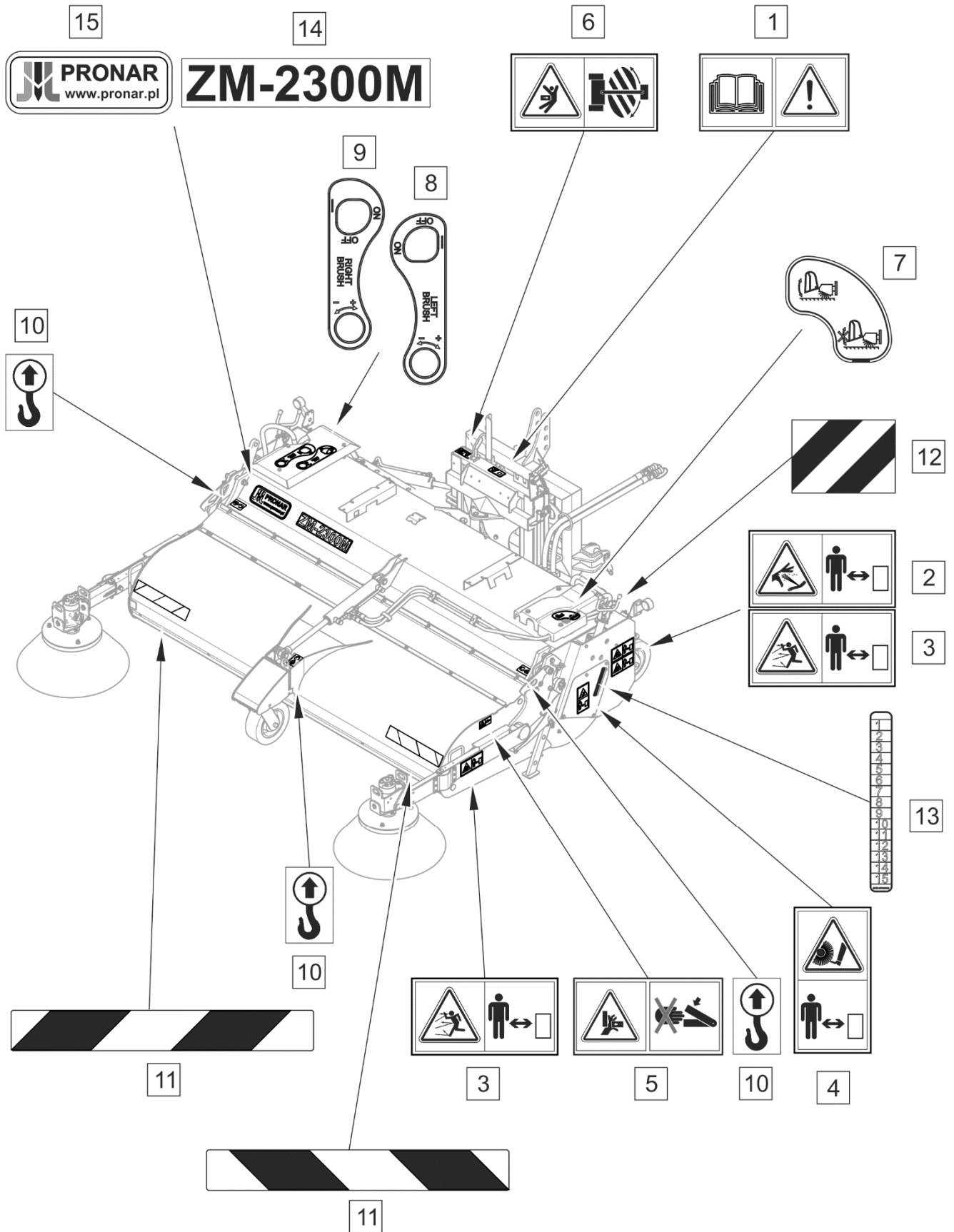


FIGURE 2.1 Locations of information and warning decals.

Meaning of symbols (TABLE 2.1)

SECTION

3

**DESIGN
AND OPERATION**

3.1 TECHNICAL SPECIFICATION

TABLE 3.1 BASIC TECHNICAL DATA

	Unit	
Model	–	ZM-2300M
Mounting method: - front three point linkage - other	– –	cat. II according to ISO 730-1 individual order
Sweeping width (<i>perpendicularly 0°</i>): - without side brush - with 1 side brush - with 2 side brushes Sweeping width (<i>tilt of 25°</i>): - without side brush	mm mm mm mm	2 300 2 740 3 170 2 135
Capacity (<i>for recommended working speed</i>) - without side brush - with 1 side brush - with 2 side brushes	m ² /h m ² /h m ² /h	13 800 16 440 19 020
Recommended sweeping speed	km/h	6
Transport speed (<i>maximum</i>)	km/h	25
Waste tank capacity	dm ³	470
Brush drive	–	external hydraulic system of the carrying vehicle
Demand for hydraulic oil (<i>minimum / optimum</i>)	l/min	40 / 60÷80
Control	-	external hydraulic system of the carrying vehicle, control panel
Tare weight: - two side brushes, with sprinkler system - one side brush, with sprinkler system - without side brushes, sprinkler system and waste tank	kg kg kg	1 065 1 000 735
Rotation speed of brushes (<i>recommended / maximum</i>)	RPM	100-150 / 195
Capacity of the sprinkler system's water tank (<i>depending on type of tank</i>)	dm ³	320 or 200
Number of sprinkling nozzles: - without side brushes - with one side brush - with two side brushes	pc. pc. pc.	8 9 10
Supply of clearance lights and sprinkler system	–	12V electrical system of the carrying vehicle

Level of noise emitted by the sweeper does not exceed 70 dB(A)

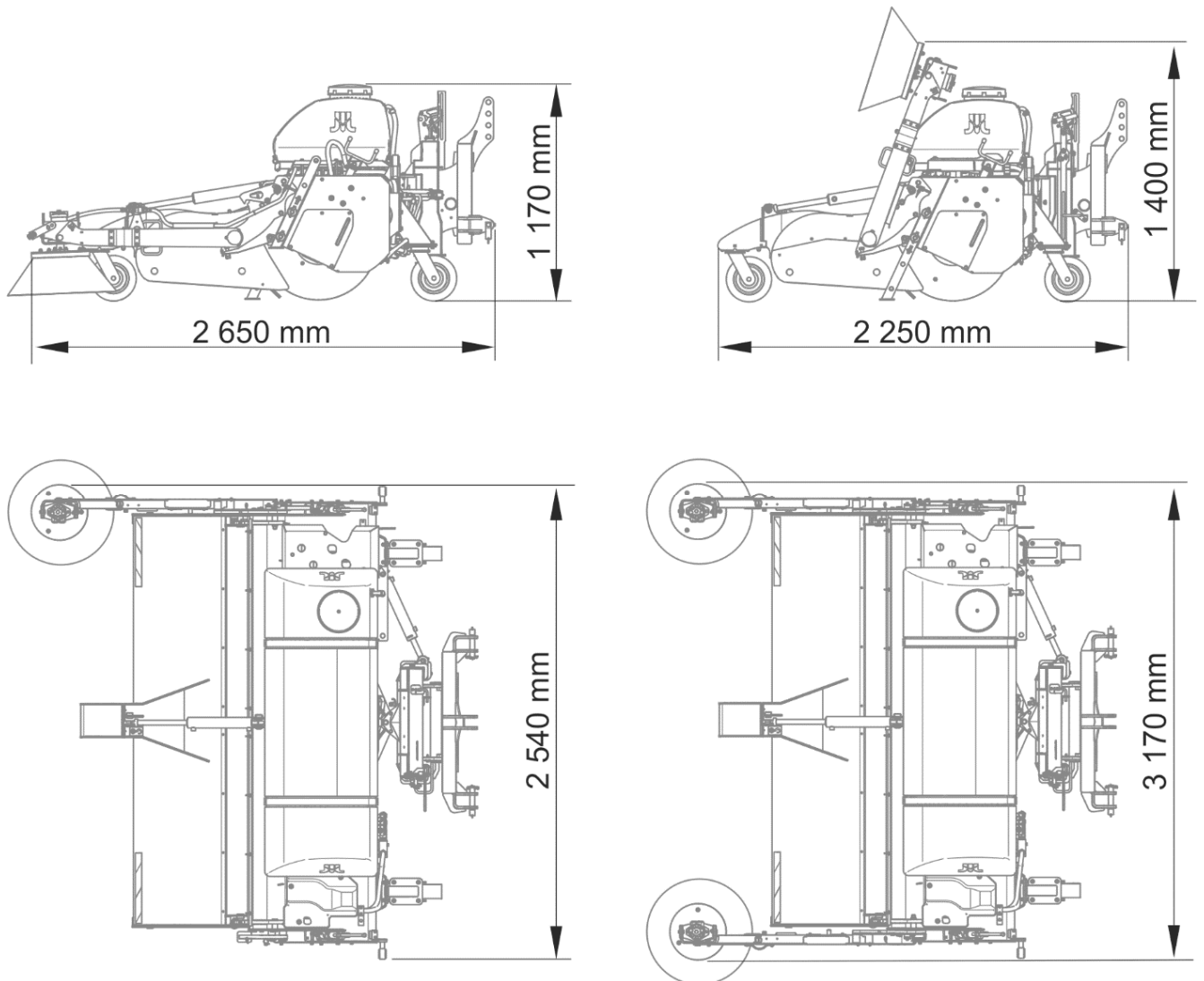


FIGURE 3.1 External dimensions depending on the machine version
dimensions of the three-point linkage

3.2 GENERAL DESIGN

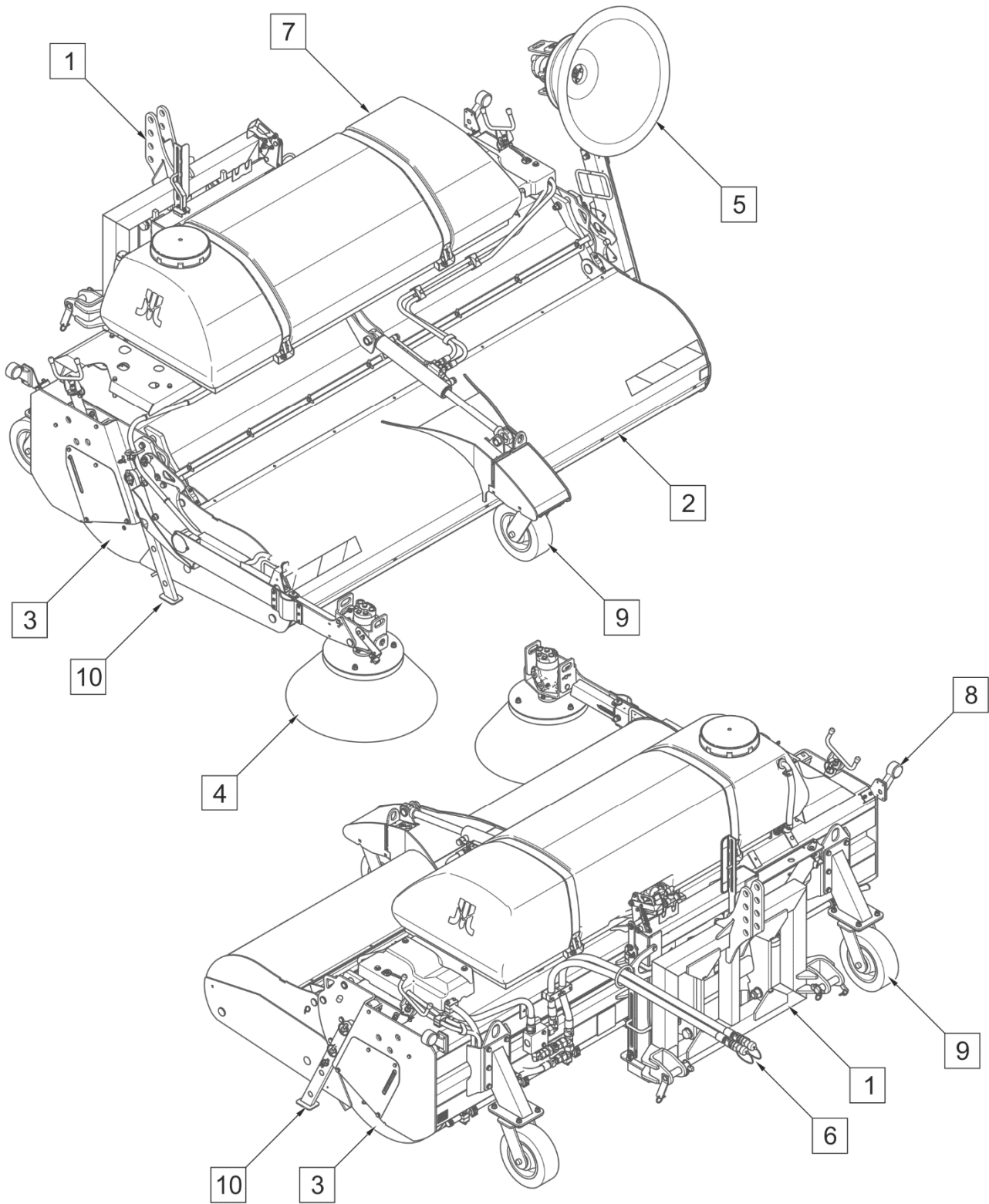


FIGURE 3.2 General design

(1) - linkage; (2) - waste tank; (3) - roller brush; (4) - right side brush; (5) - left side brush; (6) - hydraulic system; (7) - sprinkler system; (8) - electrical system; (9) - support wheel; (10) - parking stand

3.3 HYDRAULIC SYSTEM

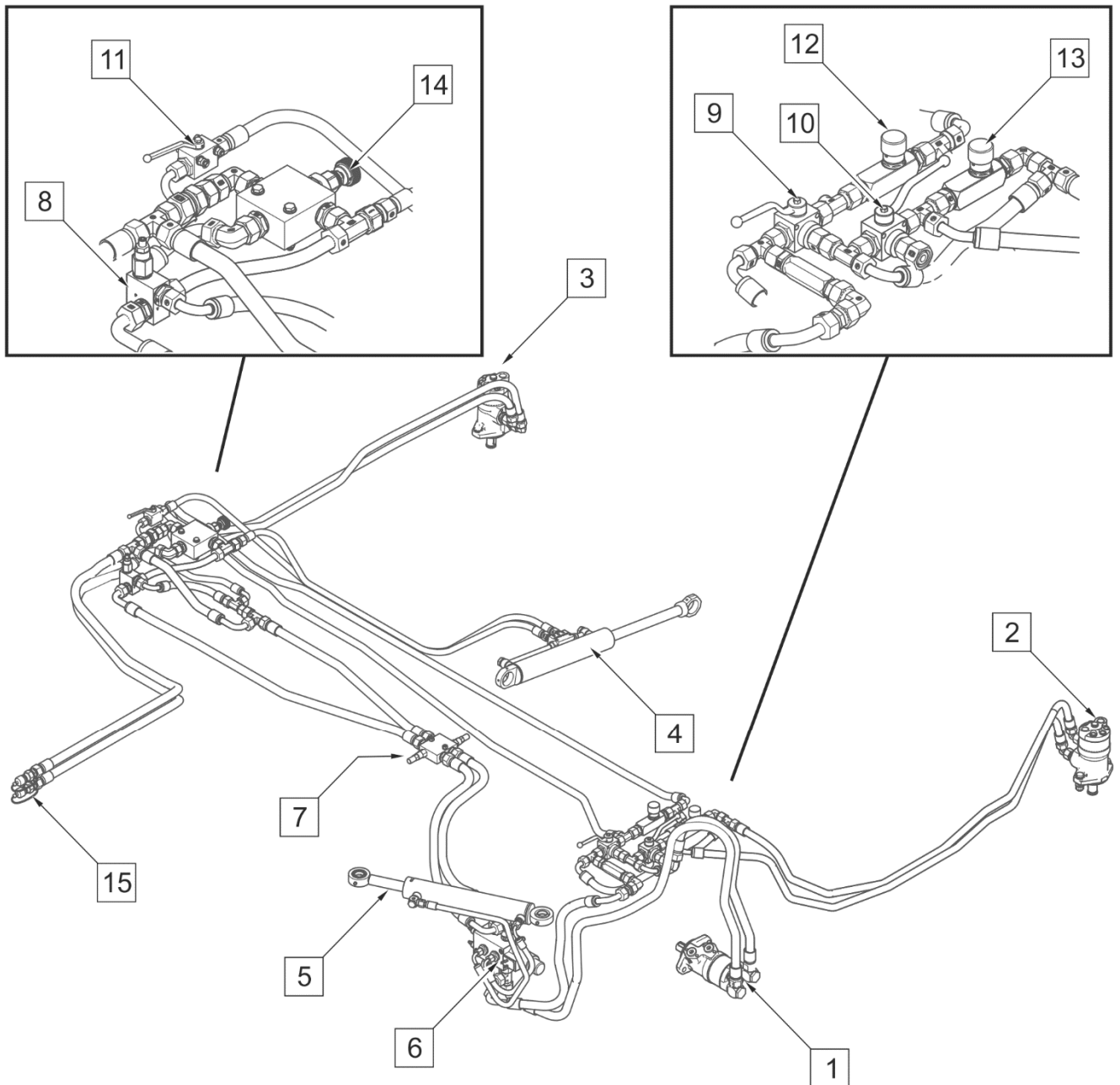


FIGURE 3.3 Hydraulic system components

(1) - hydraulic motor of roller brush; (2) - hydraulic motor of right side brush; (3) - hydraulic motor of left side brush; (4) - hydraulic cylinder for rising the waste tank; (5) - hydraulic cylinder of steering system; (6) - solenoid valve of hydraulic steering system; (7) - cross overflow valve; (8) - overflow valve; (9) - cut-off valve of left brush; (10) - cut-off valve of right brush; (11) - waste tank interlock valve; (12) - throttle valve of left brush; (13) - throttle valve of right brush; (14) - flow regulator; (15) - hydraulic quick coupler

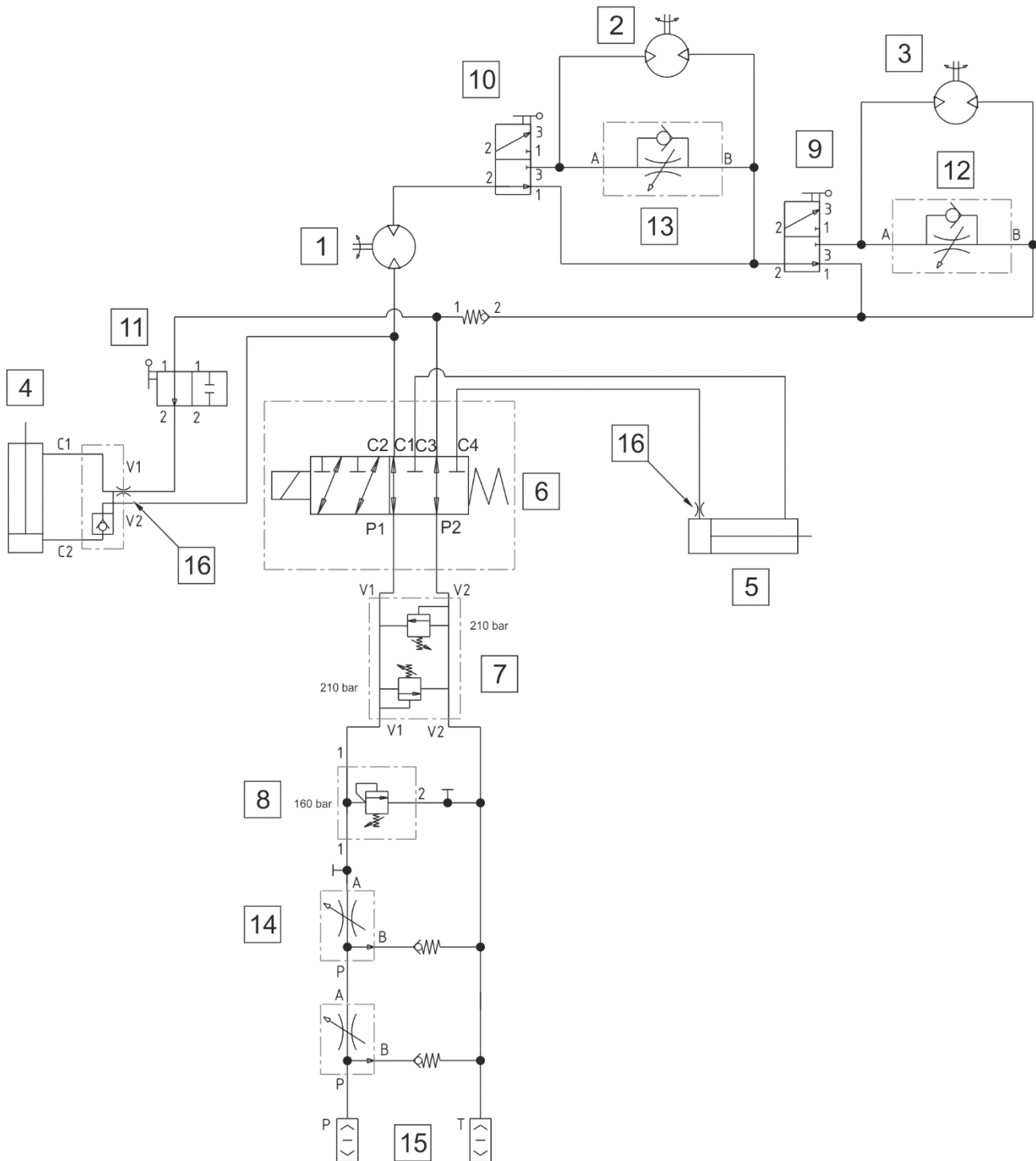


FIGURE 3.4 Hydraulic system diagram

(1) - hydraulic motor of roller brush; (2) - hydraulic motor of right brush; (3) - hydraulic motor of left brush; (4) - hydraulic cylinder for rising the waste tank; (5) - hydraulic cylinder of steering system; (6) - solenoid valve of hydraulic steering system; (7) - cross overflow valve; (8) - overflow valve; (9) - cut-off valve of left brush; (10) - cut-off valve of right brush; (11) - waste tank interlock valve; (12) - throttle valve of left brush; (13) - throttle valve of right brush; (14) - flow regulator; (15) - quick couplers; (16) - orifice

3.4 SPRINKLER SYSTEM

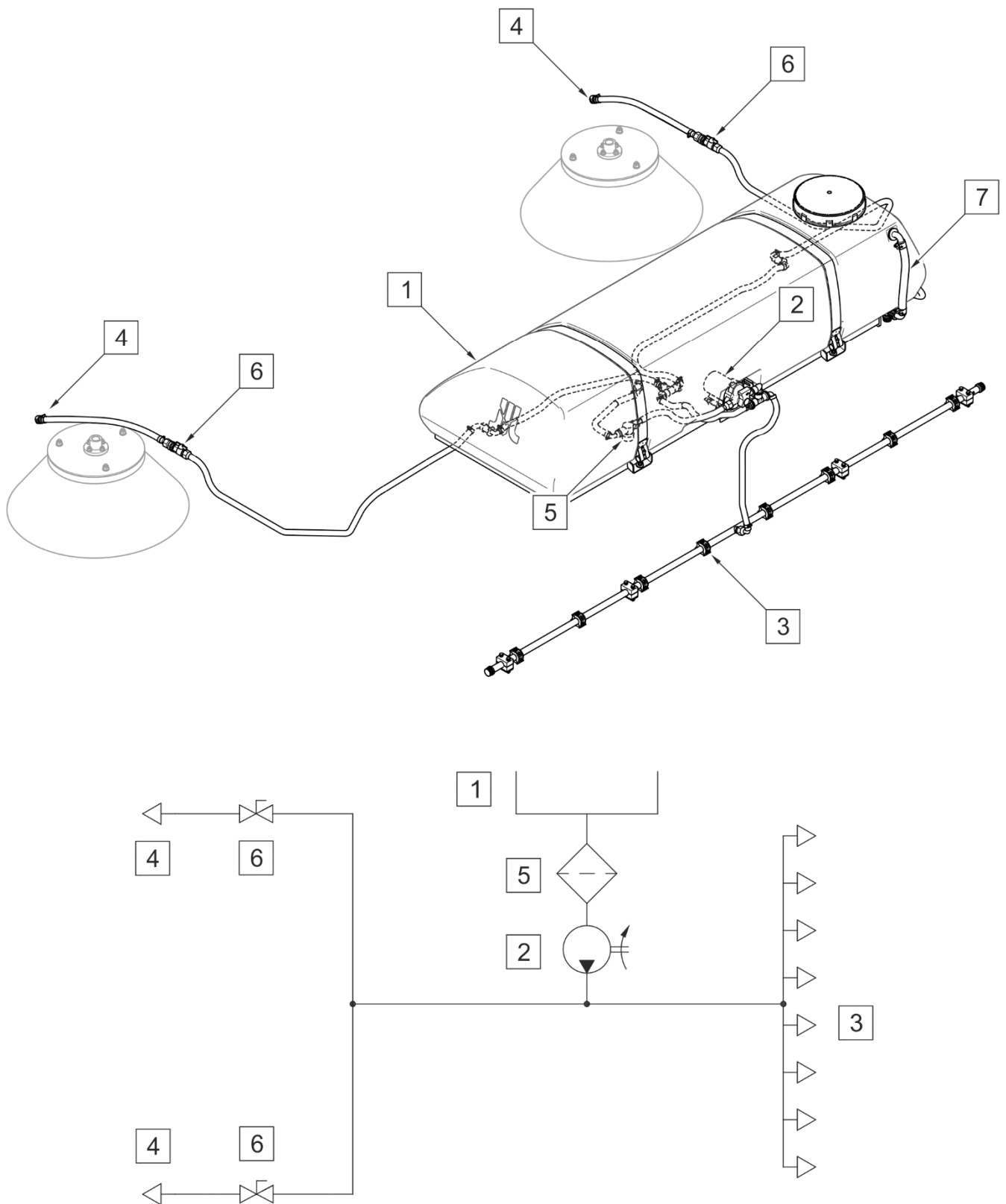


FIGURE 3.5 Sprinkler system components

(1) - water tank; (2) - water pump; (3) - sprinkling nozzles of roller brush; (4) - sprinkling nozzles of side brush; (5) - water filter; (6) - valve; (7) - water level indicator

3.5 ELECTRICAL SYSTEM

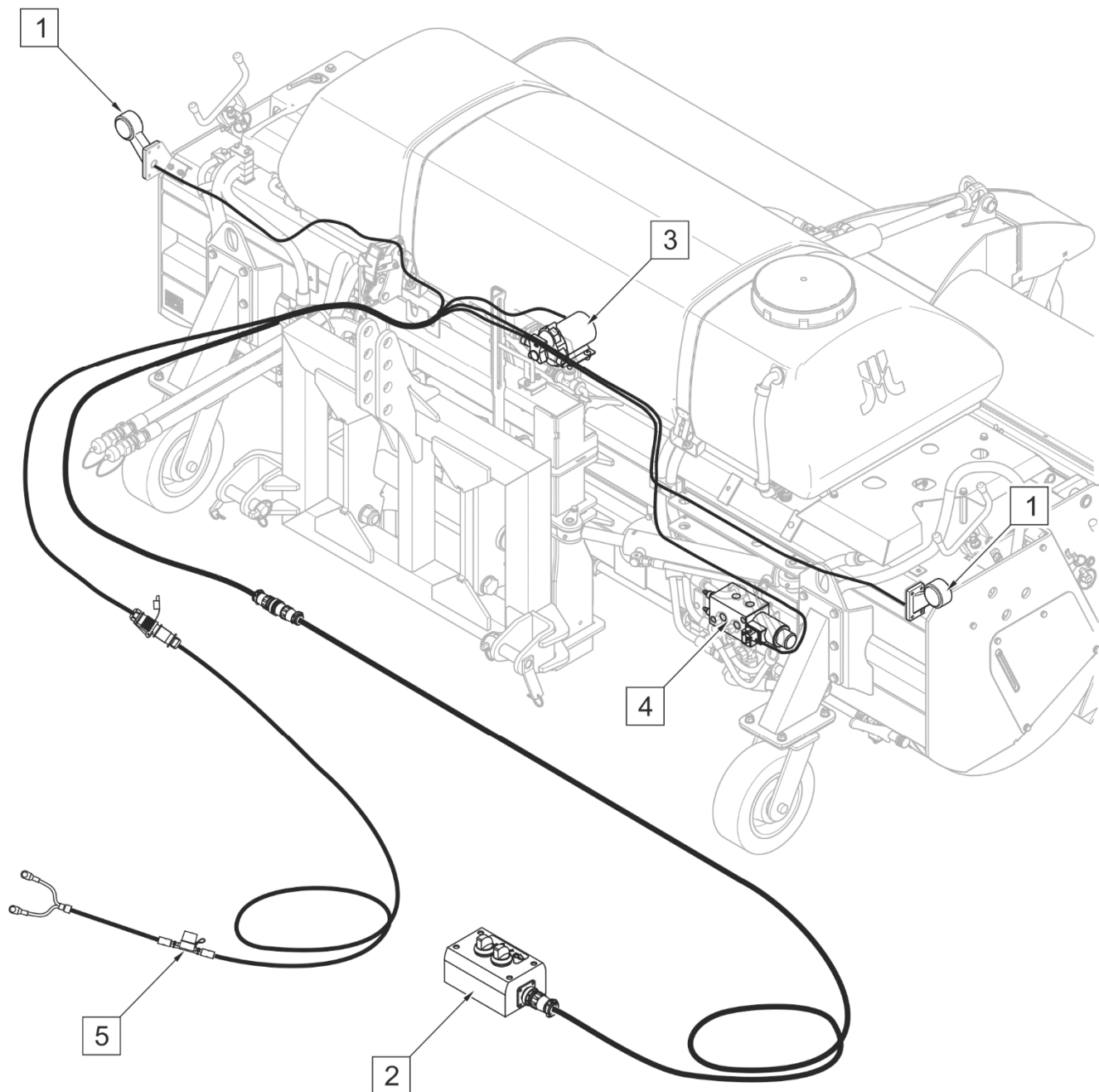


FIGURE 3.6 Electrical system components

(1) - clearance light; (2) - control panel; (3) - water pump; (4) - solenoid valve of hydraulic steering system (option); (5) - power lead with a fuse

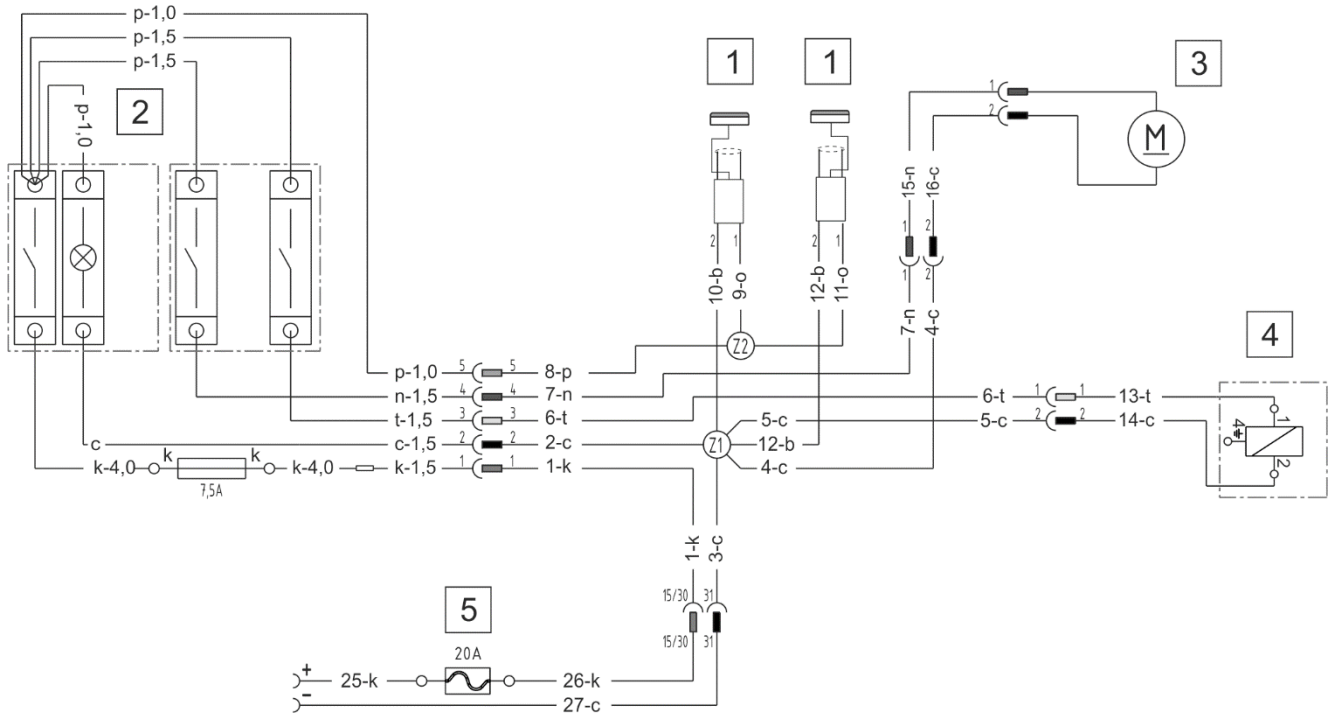


FIGURE 3.7 Electrical system concept diagram

(1) - clearance light; (2) - control panel; (3) - water pump; (4) - solenoid valve (option);
 (5) - power lead with a fuse

SECTION

4

**CORRECT
USE**

4.1 PREPARING FOR WORK

DANGER



Before using the machine, the user must carefully read this Operator's Manual.

The machine must never be used by persons who are not authorised to drive carrying vehicles, including children and people under the influence of alcohol or other drugs.

Non-compliance with the safety rules of this Operator's Manual can be dangerous to the health and life of the operator and others.

Before starting the machine, make sure that there are no bystanders in the danger zone.

The manufacturer guarantees that the machine is fully operational and has been checked according to quality control procedures and is ready for normal use. This does not release the user from an obligation to check the machine's condition after delivery and before first use. The machine is delivered to the user completely assembled. Prior to connecting to the carrying vehicle, machine operator must verify the machine technical condition. In order to do this:

- the user must carefully read this Operator's Manual and observe all recommendations, understand the design and the principle of machine operation
- check the condition of protective paint coat,
- inspect machine's individual components for mechanical damage resulting from incorrect transport (dents, piercing, bent or broken components),
- check all the lubrication points, lubricate the machine as needed according to recommendations provided in section 5 *MAINTENANCE*,
- check technical condition of the hydraulic system;
- check technical condition and completeness of hitching system pins and securing cotter pins,
- check technical condition of protective shields and correctness of mounting of the shields and warning signs.

**DANGER**

Before starting the carrying vehicle with the hitched sweeper make sure the external hydraulic system control levers are in off position, otherwise it may lead to uncontrolled operation of the machine.

**ATTENTION**

Non-adherence to the recommendations contained in the Operator's Manual or improper use may cause damage to the machine.

The technical condition before starting the machine must be no cause for concern.

If all the above checks have been performed and there is no doubt as to the machine's good technical condition, it can be connected to carrying vehicle, started and all its individual systems checked. In order to do this:

- fill the sprinkler system's tank with water (see *4.4.4 CONTROL OF SPRINKLER SYSTEM*)
- connect the machine to the carrying vehicle's linkage (see *HITCHING TO CARRYING VEHICLE*),
- connect hydraulic system conduits and electrical system leads,
- start the machine (see *4.4.1 SWEEPER OPERATION*)
- check operation of the hydraulic system and control the system for tightness,
- check operation of the sprinkler system and the clearance lights.

In the event of a disruption in the operation of the machine immediately discontinue its use, find and remove the fault. If a fault cannot be rectified or the repair could void the warranty, please contact the Manufacturer for additional clarifications.

**ATTENTION**

Before using the machine always check its technical condition.
The machine must not be used when not in working order.

4.2 CHECKING TECHNICAL CONDITION

When preparing the machine for normal use, check individual elements according to guidelines presented in table 4.1.

TABLE 4.1 TECHNICAL INSPECTION SCHEDULE

DESCRIPTION	MAINTENANCE ACTIVITIES	FREQUENCY
Condition of safety guards	Check the technical condition of safety guards, if complete and correctly mounted.	Before starting work
Correct installation of roller brush and side brush (depending on the machine version)	Check if correctly installed	
Technical condition of roller brush and side brush (depending on the machine version)	Visually inspect and, if necessary, replace	
Technical condition and operation of lighting system components.	Visually inspect the technical condition, check operation after connecting to the carrying vehicle.	
Technical condition of warning signs	Inspect visually the legibility and completeness of warning signs	
Cleanliness of water filter	Check and clean if necessary	Every 50 working hours of the sprinkler system
Check if all main nut and bolt connections are properly tightened	Tightening torque values should be according to table (5.6)	Every 6 months
Lubrication	Lubricate elements according to section „5.9 LUBRICATION”.	According to table (5.5)



ATTENTION

Do not use a malfunctioning or deficient machine.

4.3 HITCHING TO CARRYING VEHICLE



ATTENTION

Before hitching the machine to carrying vehicle, the user must carefully read the operator's manual of the carrying vehicle.



DANGER

When hitching, there must be nobody between the machine and the carrying vehicle. Exercise caution when hitching the machine to carrying vehicle.

The sweeper can be hitched to a carrying vehicle that meets the requirements contained in Table 1.1. *"REQUIREMENTS FOR CARRYING VEHICLE"*.

Before hitching the sweeper to the carrying vehicle, check the compatibility of the machine's linkage with the carrying vehicle's linkage. Because the sweeper can be equipped with different types of linkage, comply with the principles of hitching specified by the carrying vehicle manufacturer.



DANGER

To hitch the machine to carrying vehicle use only genuine pins and safeguards. Comply with the recommendations relating to linkage and mounting points.

The sweeper should be supplied from the 3-pin 12V DIN 9680 electrical socket installed on the front of the carrying vehicle. If the carrying vehicle is not equipped with such a socket or is equipped with a different type of socket, carry out the socket installation according to the diagram (FIGURE 4.1). Connect power lead (B) to the carrying vehicle's electrical system and place socket (2) near the front three-point linkage. Connect plug (1) to socket (2). There is a UNIVAL 20 A fuse (3) on the „+” supply conduit.

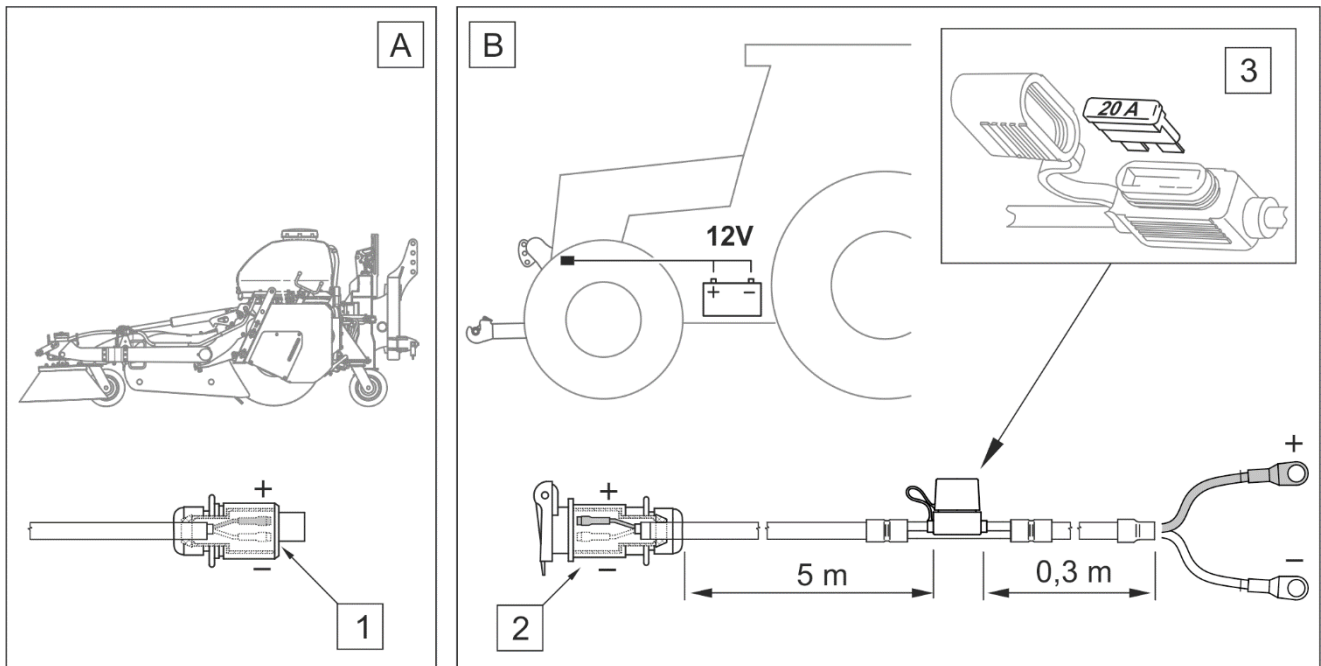



FIGURE 4.1 Connecting power lead to electrical system

(A) - elements of the sweeper's electrical system; (B) - power lead in the carrying vehicle;
 (1) - 3-pole plug; (2) - 3-pole socket; (3) - UNIVAL 20A fuse



ATTENTION

Adhere to the instructions of the carrying vehicle manufacturer when hitching the sweeper.

When hitching the sweeper to the tractor's front three-point linkage, adhere to the following guidelines:

- Drive the tractor forwards so as to move the lower links of the tractor's three-point linkage to the pins of the sweeper's linkage. Both links of the three-point linkage should be set at the same height.
- Connect the lower pins (1) of the sweeper linkage (FIGURE 4.2) with the lower links of the tractor and secure with cotter pins (3). Using a pin, connect top link of the tractor linkage (central connector) with the proper opening of the top point of the sweeper linkage and secure.
- Eliminate lateral movements of machine by appropriate adjustment of the lower link stabilisers; both lower links of the three-point linkage are recommended to be set at the same height,

- Connect hydraulic conduit plugs (FIGURE 4.4) to appropriate sockets on the carrying vehicle. Connect electrical system plug to 12V 3-pole socket.
- Raise the sweeper using the tractor three point linkage, raise the parking stands and lock them in upper position (FIGURE 4.5)

When hitching the sweeper to another type of linkage, adhere to the instructions of the carrying vehicle manufacturer.

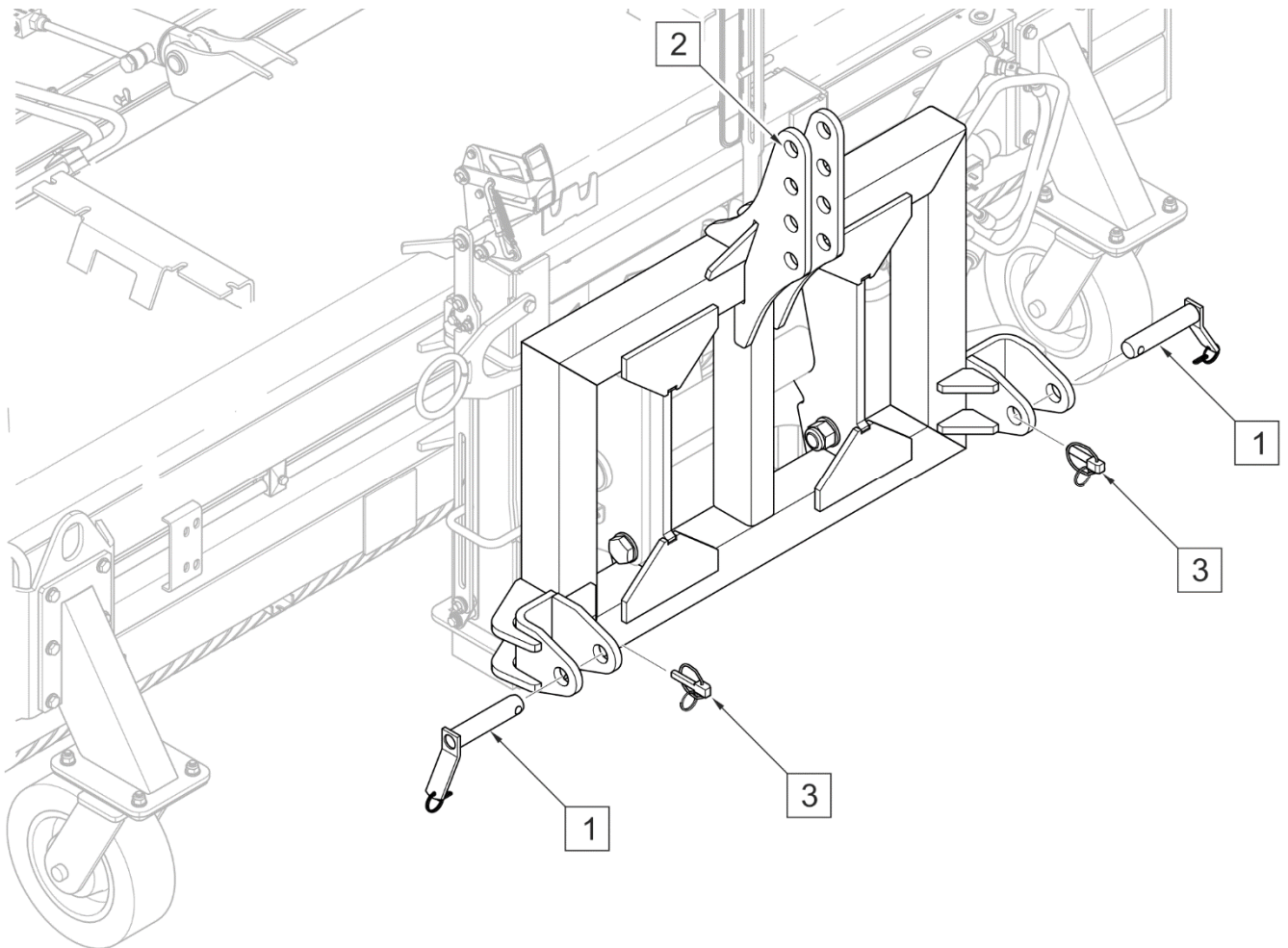


FIGURE 4.2 Category II three-point linkage according to ISO730-1

(1) - mounting pin of lower links of three point linkage; (2) - mounting points of top link (so-called central connector); (3) - securing cotter pins

In order to hitch the sweeper (FIGURE 4.3) to the carrying vehicle equipped with pallet fork:

- A. Set proper width of the carrying vehicle's pallet fork. Pull out locks (1) and lower both locking levers (2) in the sweeper's linkage.
- B. Loosen counter nuts (3) and unscrew clamp bolts (4) to enable insertion of fork.
- C. Insert the carrying vehicle's fork to the sweeper's linkage until the fork rests on the frame. Tighten both clamp bolts (4) and counter nuts (3).
- D. Lock levers (2) in their upper position (if it is possible due to fork design).

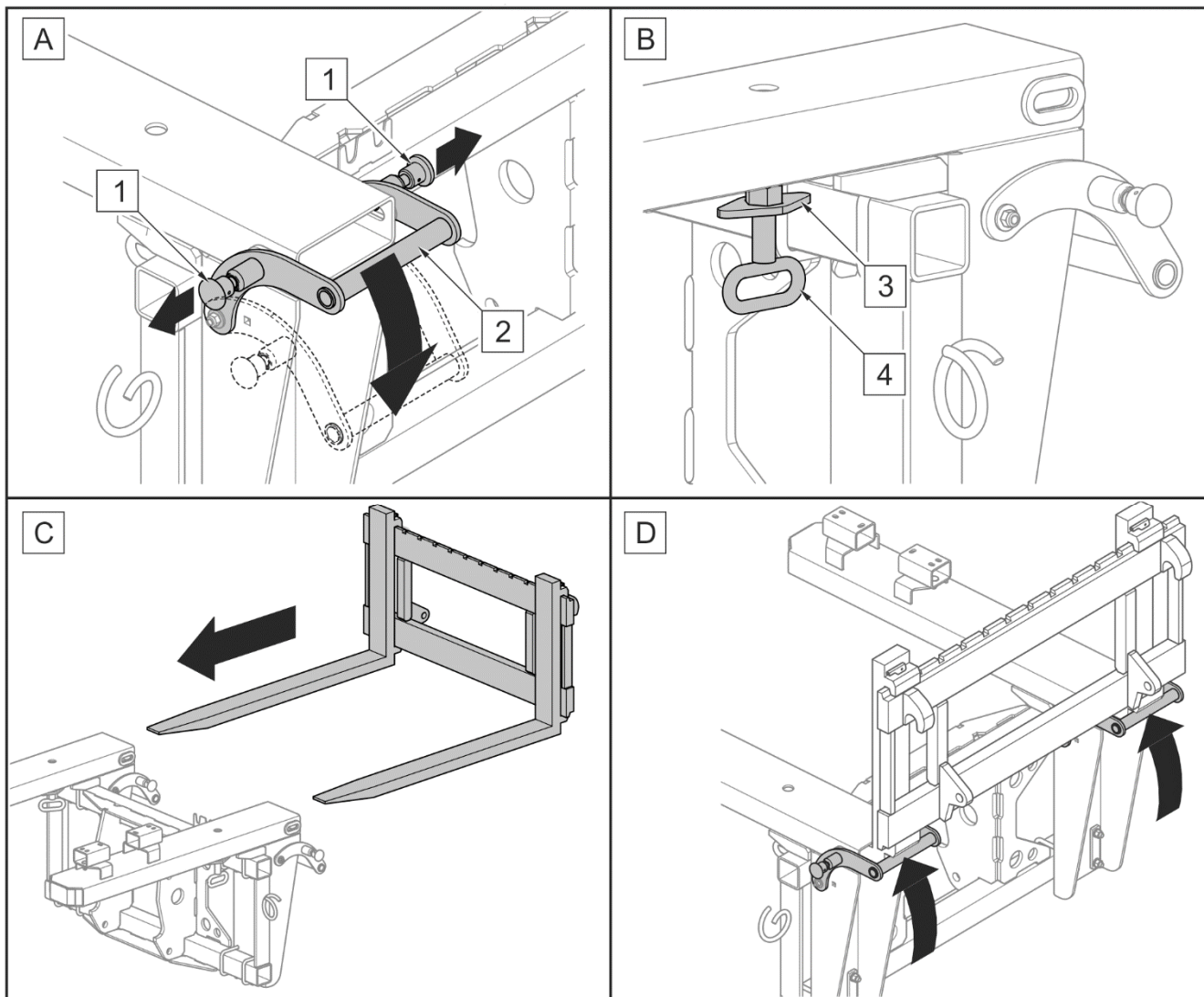


FIGURE 4.3 Linkage for forklift truck

(A,B,C,D) - mounting sequence; (1) - lever locks; (2) - locking levers; (3) - clamp bolts; (4) - counter nuts

**DANGER**

Prior to connecting individual system conduits the user must carefully read the carrying vehicle operator's manual and observe all Manufacturer's recommendations.

**DANGER**

When connecting the hydraulic conduits, make sure that the hydraulic system of the carrying vehicle is not under pressure.

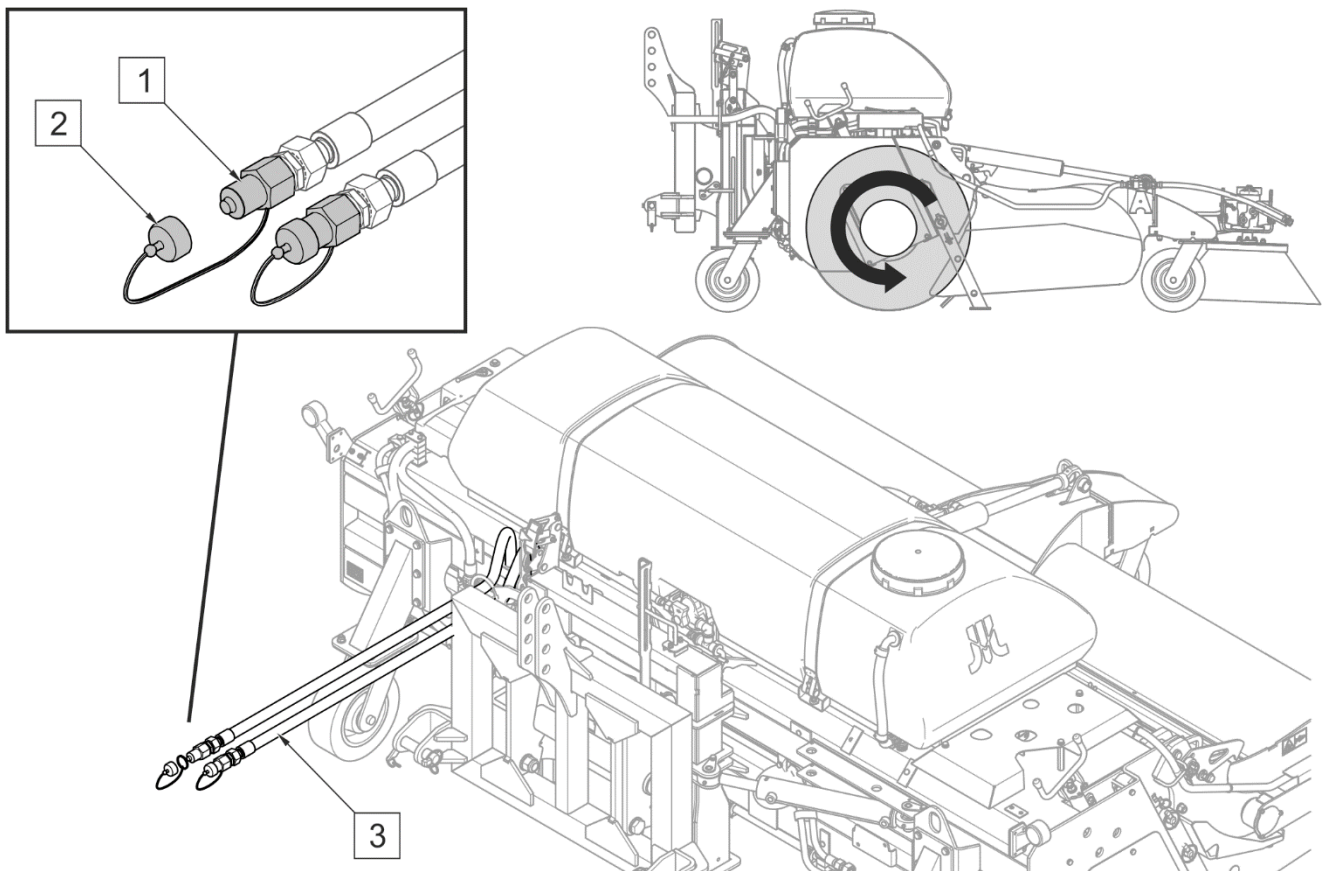


FIGURE 4.4 Hydraulic system connection

(1) - hydraulic conduit connectors; (2) - protective plugs; (3) - hydraulic conduits;

Connect hydraulic conduit connectors (1) to sockets of one section of the carrying vehicle's external hydraulic system with the function of continuous operation and the possibility of changing the direction of oil circulation (FIGURE 4.4).

Activate appropriate hydraulic circuit using the hydraulic manifold lever in the carrying vehicle. Check roller brush rotation direction. The brush should rotate in the direction opposite to travel direction.



ATTENTION

During operation, the connecting conduits should be routed so that they do not get entangled in moving machine and carrying vehicle parts.



Before beginning work using the sweeper, check the oil level in carrying vehicle's hydraulic system.

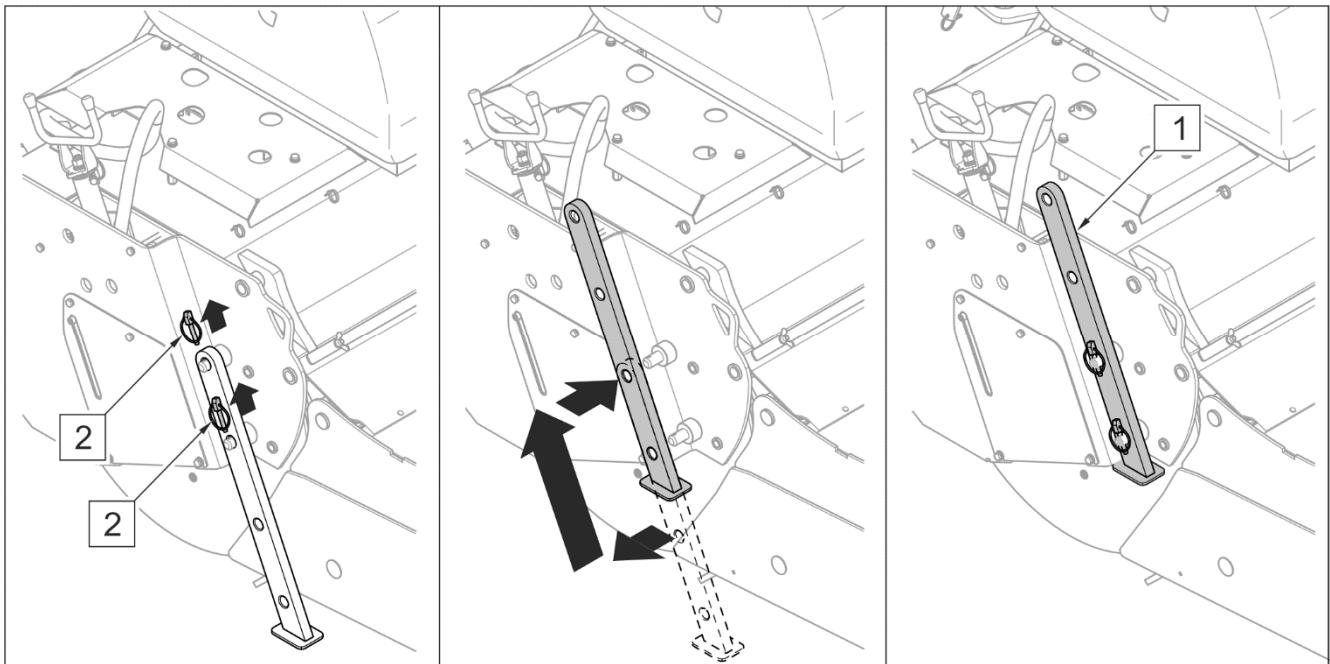


FIGURE 4.5 Raising the parking stands.

(1) - parking stands; (2) - securing cotter pin

The sweeper is equipped with two parking stands (FIGURE 4.5). When the machine is hitched and raised, lift the parking stands. To do this, take out securing cotter pins (2), move parking stands (1) to upper position and secure them with cotter pins.

4.4 SWEEPER OPERATION

4.4.1 LINKAGE SETTING



ATTENTION

During the sweeper operation, the carrying vehicle's linkage must not be set in floating position. The sweeper's linkage enables ground surface tracking.

Operating the sweeper when the linkage position or height indicator is in the red field may cause damage to the machine.

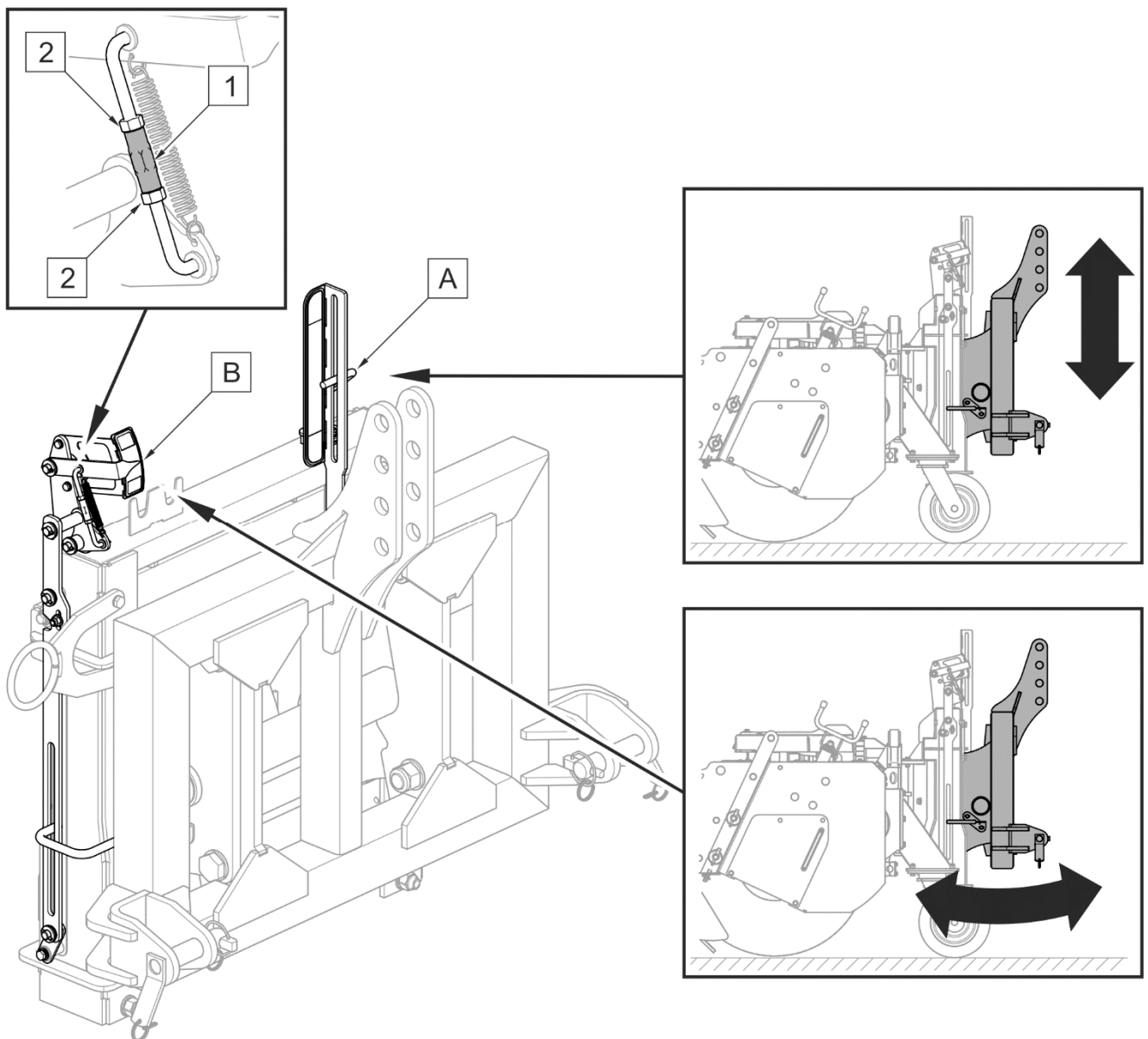


FIGURE 4.6 Height and tilt indicator

(A) - height indicator; (B) - tilt indicator; (1) - adjustment nut; (2) - counter nuts

Special design of the linkage enables ground surface tracking during sweeper operation. To enable ground surface tracking, set the carrying vehicle's linkage properly with regard to the machine (FIGURE 4.6). The sweeper's linkage should ensure the possibility of up-down movement and right-left movement with regard to the sweeper and should be set vertically in such a manner as to ensure the possibility of forward-backward tilt of the machine. To facilitate proper setting, linkage height indicator (A) and linkage tilt indicator (B) are used. The tilt indicator (B) should indicate the centre of the range (green colour) when the linkage is in the top position. Otherwise, loosen counter nuts (2) and adjust indicator (B) using nut (1).

During machine operation, both indicators (FIGURE 4.6) should be in the green colour field. Red colour indicates the end of the ground surface tracking range. To change the position of the height indicator (A), delicately raise or lower the carrying vehicle's linkage. To change the position of the indicator (B), tilt the linkage forwards or backwards. This is done by adjusting the length of the central link of the three point linkage in the tractor or by tilting the implement mounting frame in the carrying vehicle equipped with extension arm (e.g. loader arm).

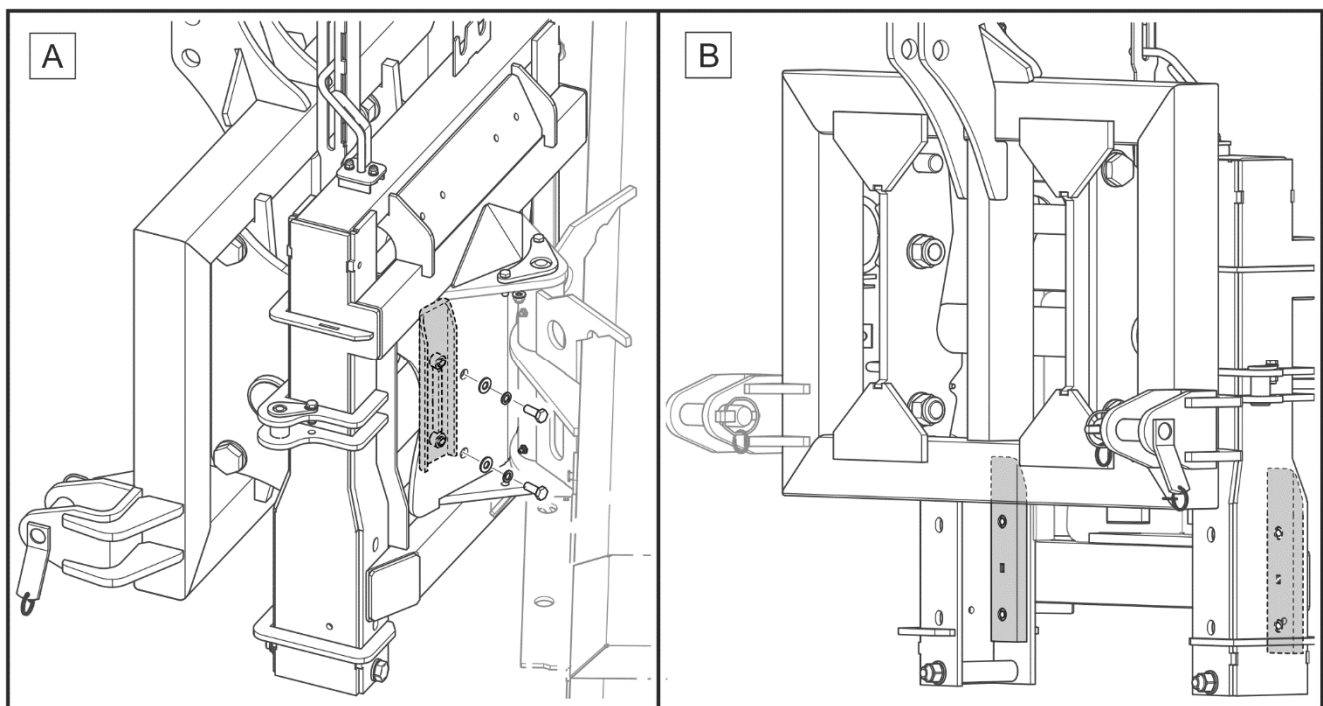


FIGURE 4.7 Linkage tilt interlocks

(A) - unlocked linkage; (B) - linkage locked against forward tilt

When operating the sweeper without the waste tank or with raised waste tank (e.g. when sweeping sideways), the linkage forward tilt interlocks should be used (FIGURE 4.7). The interlocks are stored on the linkage frame. In order to use the linkage tilt interlocks:

- Set the sweeper at an angle to facilitate access to the interlocks.
- Dismount the interlocks from the storage place (A). Keep fixing bolts and washers for further use.
- Raise the linkage in such a manner as to ensure that the height indicator (FIGURE 4.6) is located at the bottom of the range and protect the linkage against accidental lowering (e.g. using suitable and stable supports).
- Install interlocks (B) in the right and left guides on the sweeper side.

When the interlocks are installed, the linkage can not tilt the machine forwards.

4.4.2 CONTROL PANEL

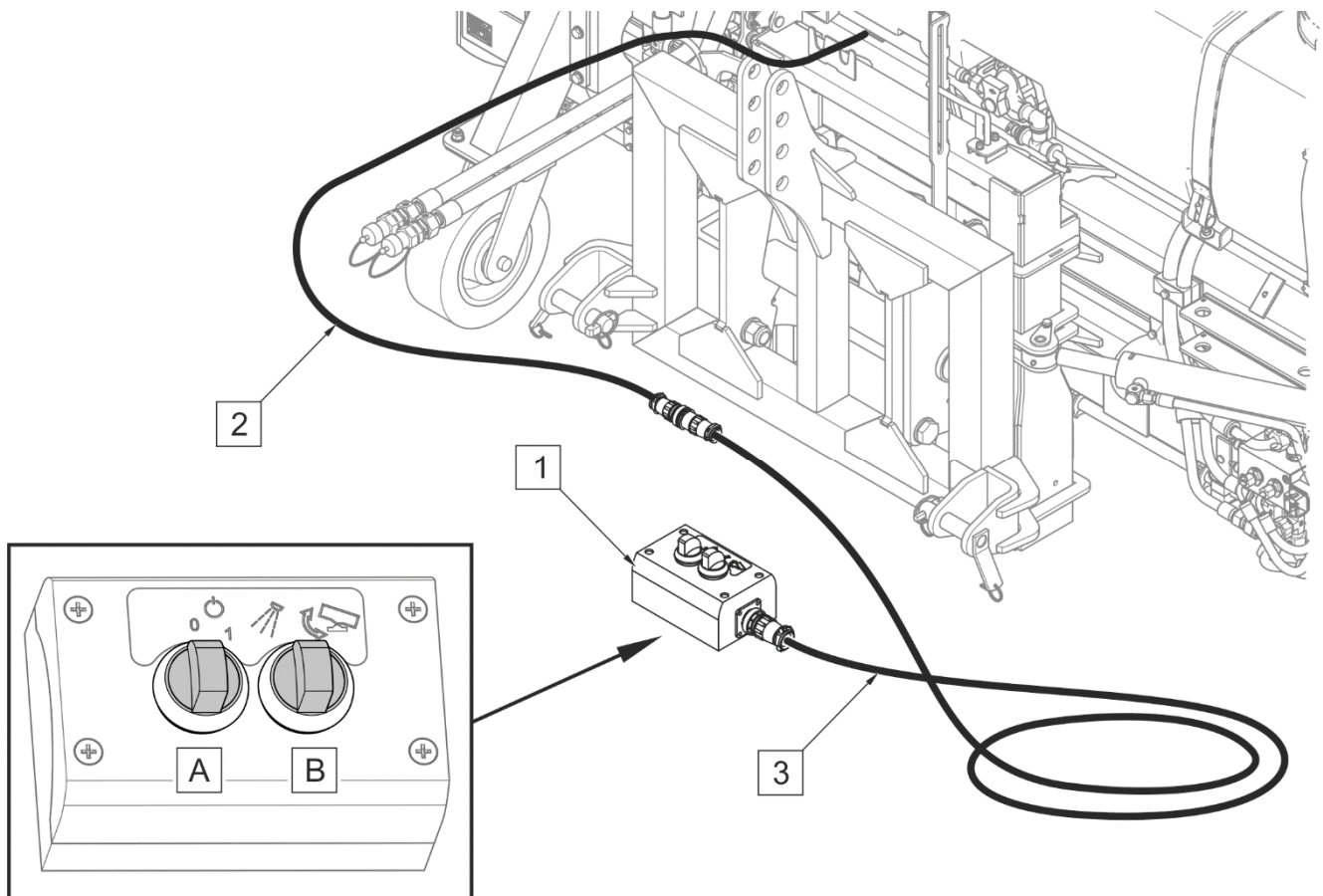


FIGURE 4.8 Control panel connection

(1)- control panel; (2)- sweeper's power supply wiring harness; (3)- extension wiring harness; (A) - main switch of control panel and clearance lights; (B) - switch of sprinkler system or hydraulic steering system

Before starting work, connect the control panel (1) to the control wiring harness (2) of the sweeper (FIGURE 4.8). If necessary, use the extension wiring harness (3). Place the control panel in the operator cab in an easily accessible place. If the switch (A) is turned clockwise to position "1", the control panel power supply and clearance lights are on. Switch (A) in position "1" is backlit in green colour. 3-position switch (B) is used for switching on/off the sprinkler system and for switching on/off the hydraulic steering system (option).

4.4.3 CHANGE OF WORKING POSITION

The sweeper should be set at an angle when sweeping sideways, without collecting waste to the tank.

Depending on the sweeper version, the working position (right/left) can be changed mechanically (manually) or hydraulically from the driver's position.

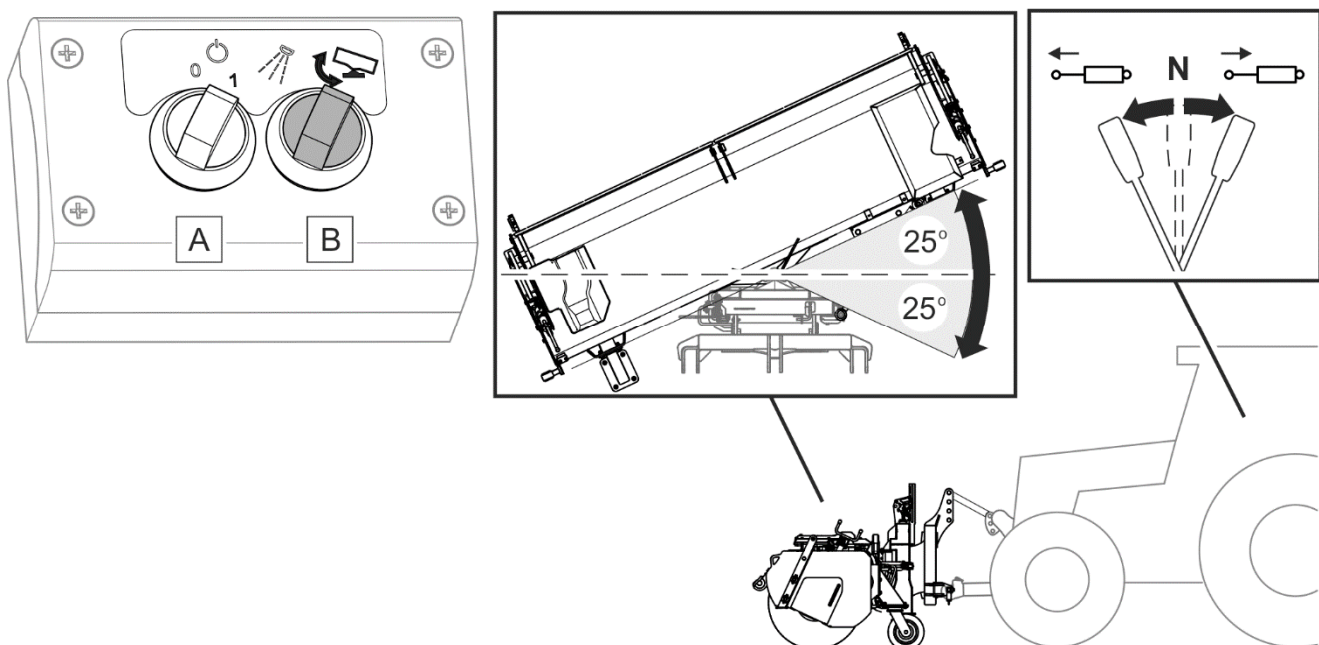


FIGURE 4.9 Change of working position (sweeper with hydraulic turning system)

(A) - main switch; (B) - hydraulic steering system switch

The working angle of the sweeper equipped with the hydraulic steering system (option) can be smoothly adjusted (to the right / left) within the range of $+25^{\circ}$ / -25° . The working position is changed by means of the hydraulic cylinder. To switch on the hydraulic steering (turning) function, turn the switch (B) on the control panel maximally to the right (clockwise) and then, change the sweeper's working position by controlling the external hydraulic system of the carrying vehicle. In order to switch on the hydraulic steering (turning) function, the main switch (A) should be in "1" position (ON).

**ATTENTION**

The hydraulic steering (turning) function will be switched off when power supply is off.

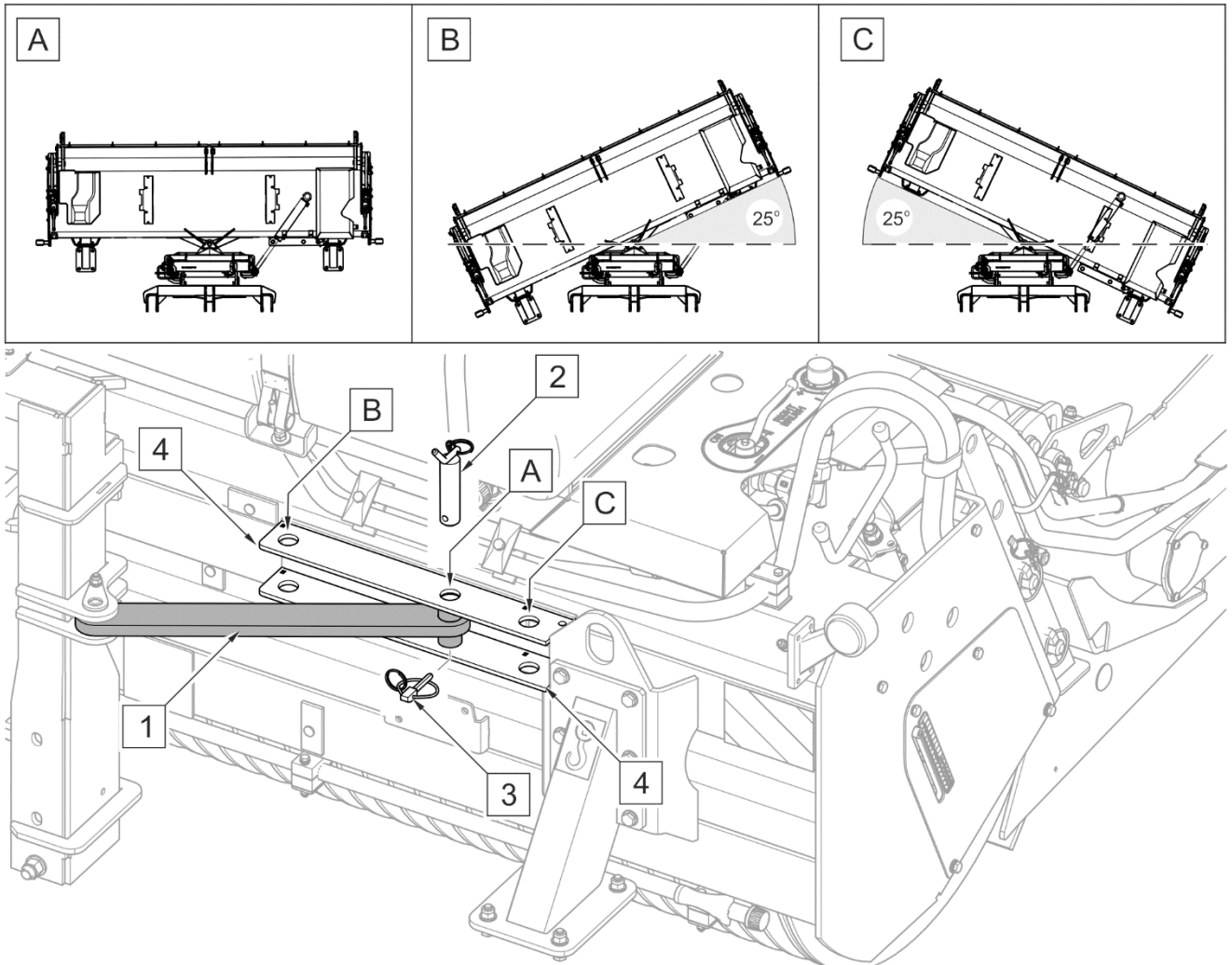


FIGURE 4.10 Change of working position (sweeper with mechanical steering system)
 (A) - straight; (B) - angle of 25° to the left; (C) - angle of 25° to the right; (1) - arm; (2) - pin;
 (3) - securing cotter pin; (4) strip

Three working angles (A, B or C) can be set in the sweeper equipped with mechanical brush steering (turning) system (FIGURE 4.10). To change the working angle:

- Lift the sweeper using the carrying vehicle's linkage.
- Remove securing cotter pin (3) and pin (2).
- Manually change the sweeper working angle to align a corresponding opening (A, B, C) in strip (4) with the opening in arm (1).
- Install pin (2) and secure it with cotter pin (3).

4.4.4 SPRINKLER SYSTEM CONTROL



ATTENTION

Before starting the sprinkler system, check level of water in the tank and operation of sprinklers.

The sweeper with sprinkler system is equipped with water tank holding 320 litres of water (or 200 litres, depending on version). Fill the water tank (1) through the filler opening secured with a cap (2) equipped with a vent (FIGURE 4.11). Water level is checked on the indicator (3) (this does not apply to 200-litres tank). There is the drain plug (4) at the bottom of the tank (this does not apply to 200-litres tank)

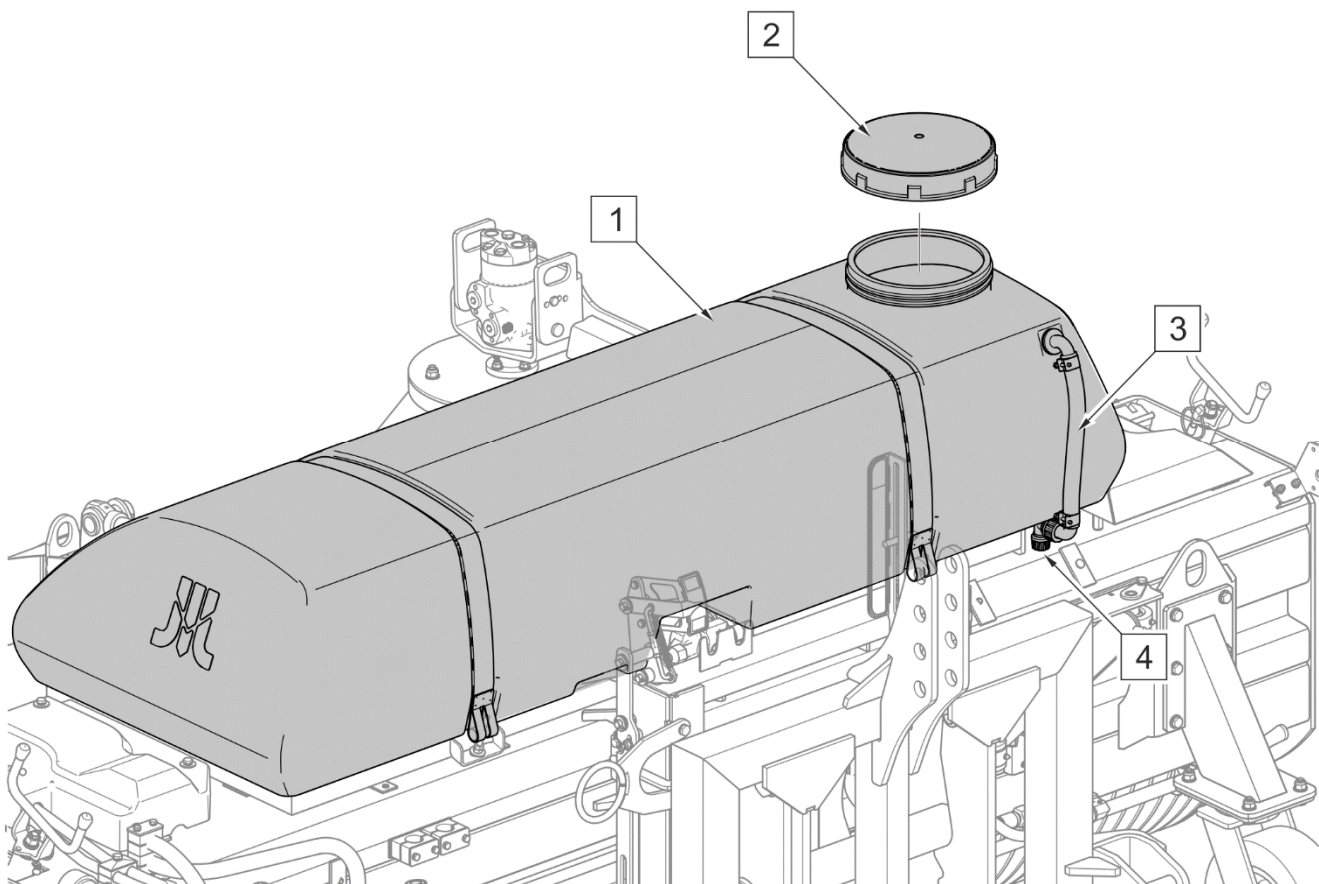


FIGURE 4.11 Water tank of sprinkler system

(1) - water tank; (2) - filler plug; (3) - water level indicator; (4) - drain plug.

To start the sweeper's sprinkler system (FIGURE 4.12), turn the switch (B) on the control panel maximally to the left. In order to switch on the sprinkler system, the main switch (A) should be in "1" position (ON).



ATTENTION

If there is a risk that temperatures drop below 0°C, drain water from the sprinkler system through drain plug (4) (FIGURE 4.11). Blow the water pump through with compressed air.

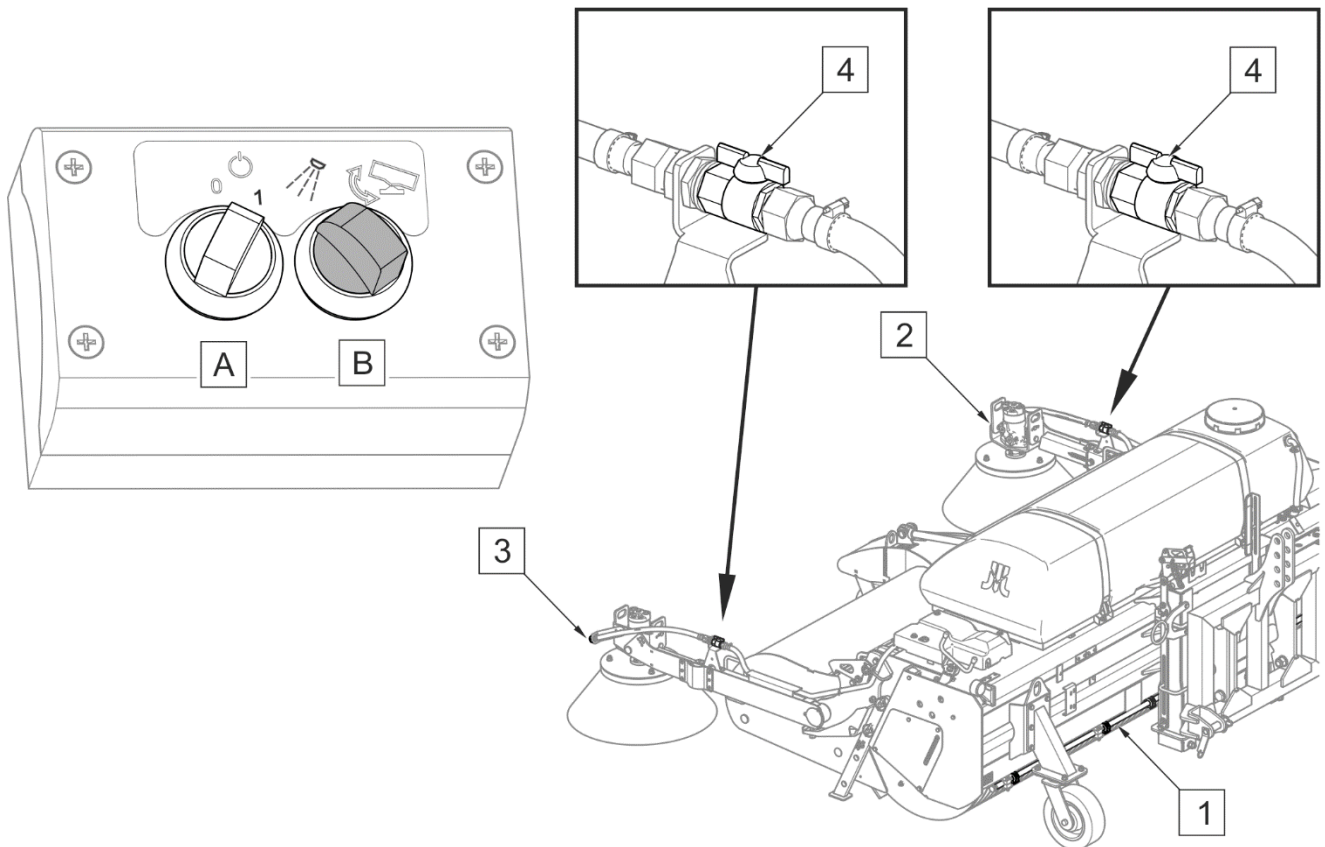


FIGURE 4.12 Sprinkler system control

(A) - main switch; (B) - sprinkler system switch; (1) - sprinkler strip of roller brush; (2) - right brush sprinkler; (3) - left brush sprinkler; (4) - cut-off valve of side brush sprinkler

Valves (4) can cut off the sprinklers (2) and (3) located next to the side brushes (FIGURE 4.12).

4.4.5 SIDE BRUSHES



DANGER

Do NOT start the side brushes in raised position.

The drive of the raised brush should be disconnected using the appropriate lever (FIGURE 4.13)

Depending on the machine version, the sweeper can be equipped with one or two side brushes. Each side brush can be switched on and off independently and their speed can be adjusted steplessly (FIGURE 4.13). Lever (1) is used for switching on and off the right side brush. Lever (2) is used for switching on and off the left side brush. To switch off the side brush drive, move proper lever, (1) or (2), to "OFF" position (the drive is OFF). Rotation speed of side brushes is adjusted using knobs (3) and (4).

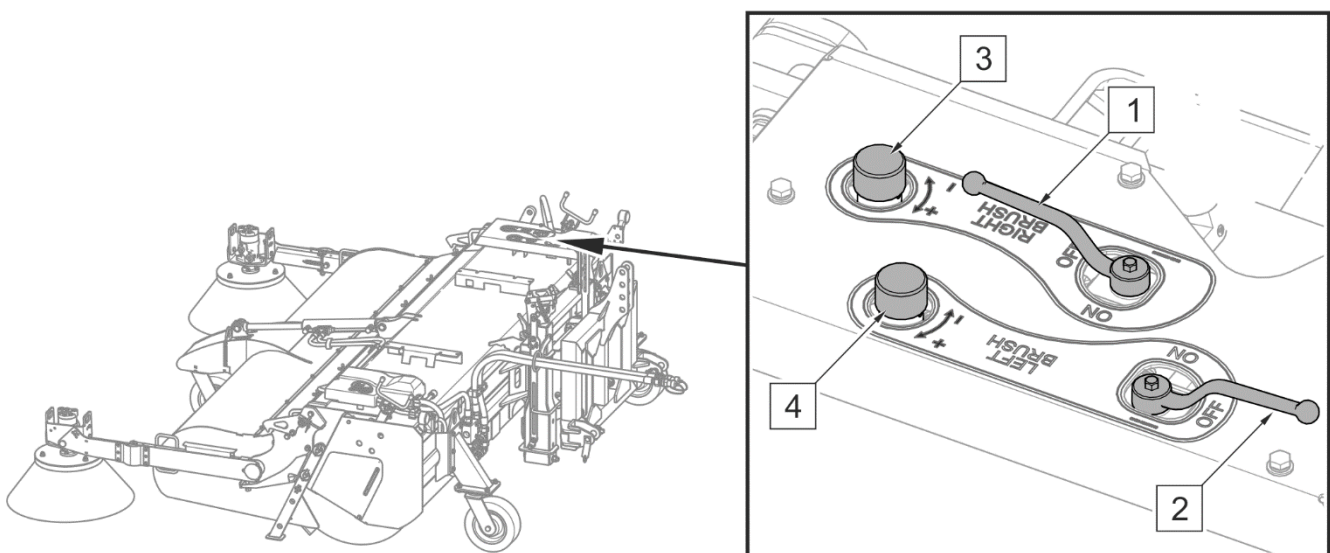


FIGURE 4.13 Control of side brush drive

(1) - lever for switching on/off the right side brush drive; (2) - lever for switching on/off the left side brush drive; (3) - knob for adjusting the speed of the right side brush; (4) - knob for adjusting the speed of the left side brush

The side brushes can be independently raised and locked in their upper position (FIGURE 4.14). In order to do this:

- Relocate securing cotter pin (1) of the latch interlock knob (2) from opening (I) to opening (II).
- Unscrew the interlock knob (2) until the latch (1) can be moved.
- Manually raise the side brush until the latch (1) is interlocked with the brush arm.

- Tighten latch interlock knob (2) and insert cotter pin (1) to opening (II).
- Switch off the side brush drive (FIGURE 4.11) and close the side brush sprinkler valve (FIGURE 4.12)

To restart the side brush, perform the above actions in reverse order.

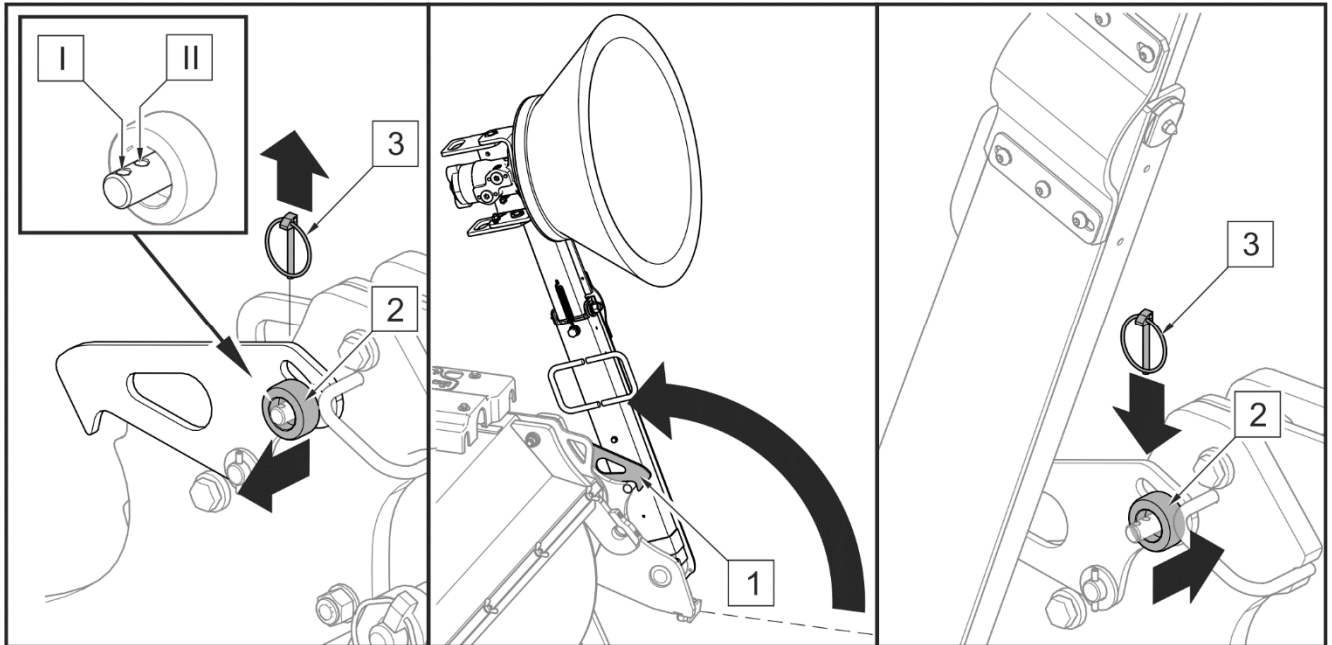


FIGURE 4.14 Raising the side brushes

(1) - latch; (2) - interlock knob; (3) - securing cotter pin; (I), (II) - cotter pin openings



ATTENTION

During operation and transport travel with raised side brush (FIGURE 4.14), interlock knob (2) should be tightened and locked with cotter pin (3) in opening (II).

4.4.6 WASTE TANK

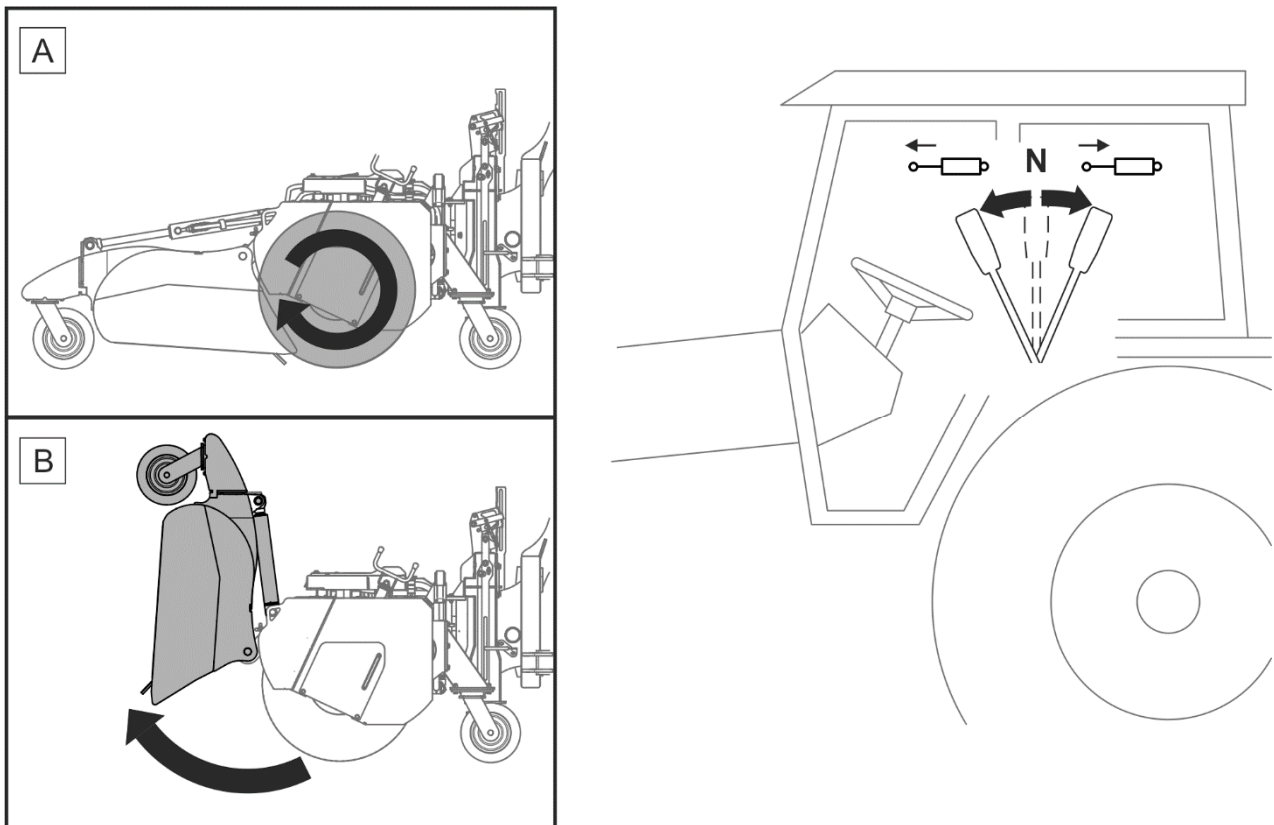


FIGURE 4.15 Emptying the waste tank

(A) - sweeping, (B) - emptying the waste tank

Waste tank emptying (FIGURE 4.15) is carried out from the driver's position using the hydraulic manifold lever, by reversing the oil flow direction.



ATTENTION

The waste tank filling level depends on type of waste.

Do NOT leave waste in the tank when temperatures drop below 0°C.

The sweeper can work with raised waste tank when sweeping to the right or left side, without collecting waste to the tank. In order to do this:

- Raise the side brushes (if installed) (FIGURE 4.14)
- Set the sweeper at an angle (see 4.4.3 CHANGE OF WORKING POSITION).
- Raise the waste tank in the same manner as during emptying (FIGURE 4.15).
- Lock the waste tank in the upper position (FIGURE 4.16) by shifting lever (2) to position (B).
- Lock the linkage (FIGURE 4.7)

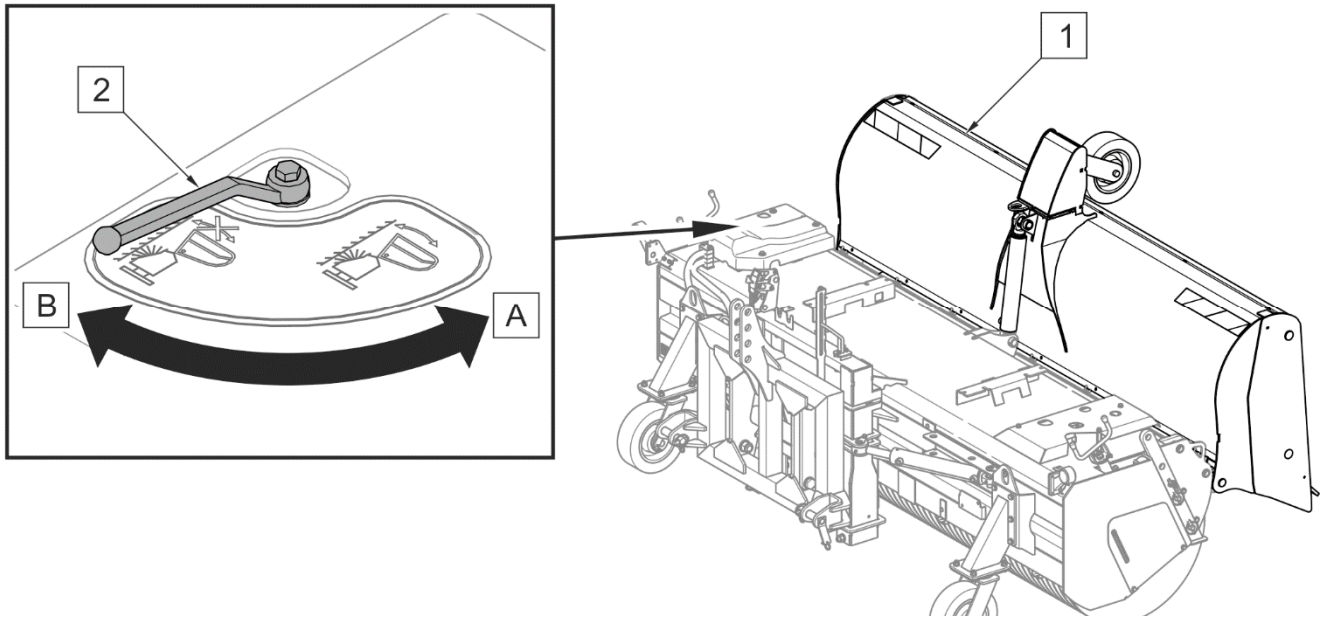


FIGURE 4.16 Waste tank interlock

(1) - waste tank; (2) - waste tank interlock lever; (A) - unlocked waste tank; (B) - locked waste tank



DANGER

Do NOT release the waste tank interlock (2) during the machine operation (FIGURE 4.16).



ATTENTION

Do NOT operate the sweeper and do NOT set it on the ground if the waste tank is not completely lowered.



ATTENTION

Be especially careful when driving over obstacles such as humps, raised wells, steep climbs. It is recommended to reduce the speed and even raise the machine.

The waste tank design (FIGURE 4.17) makes it possible to raise the tank bottom when driving over obstacles (e.g. humps) and return the bottom to its original position. Operation of the movable bottom of the waste tank should be periodically checked. If necessary, clean and lubricate cooperating components.

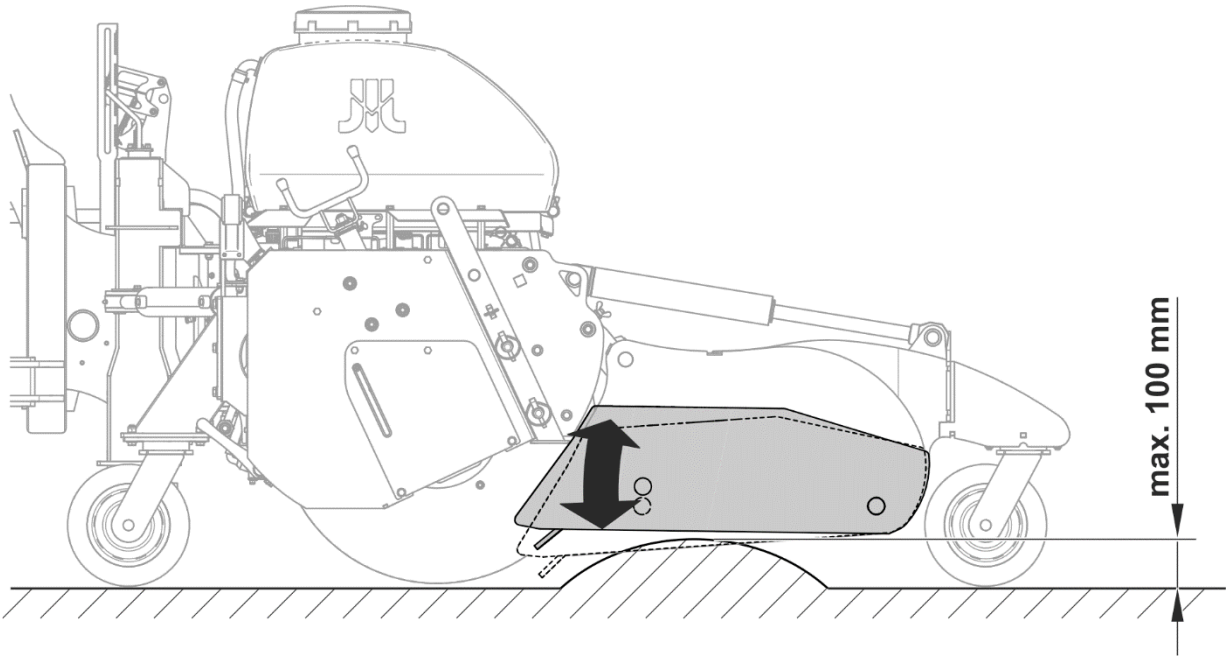


FIGURE 4.17 Movable bottom of waste tank



TIP

When sweeping light and bulky waste (e.g. leaves), the plastic strip located in front of the waste tank may be dismantled.

4.4.7 FLOW REGULATOR

The flow regulator setting should be suitable for the output of the carrying vehicle's hydraulic system supplying the sweeper. The flow regulator is set using the knob located on the left side, on the machine frame (FIGURE 4.18).

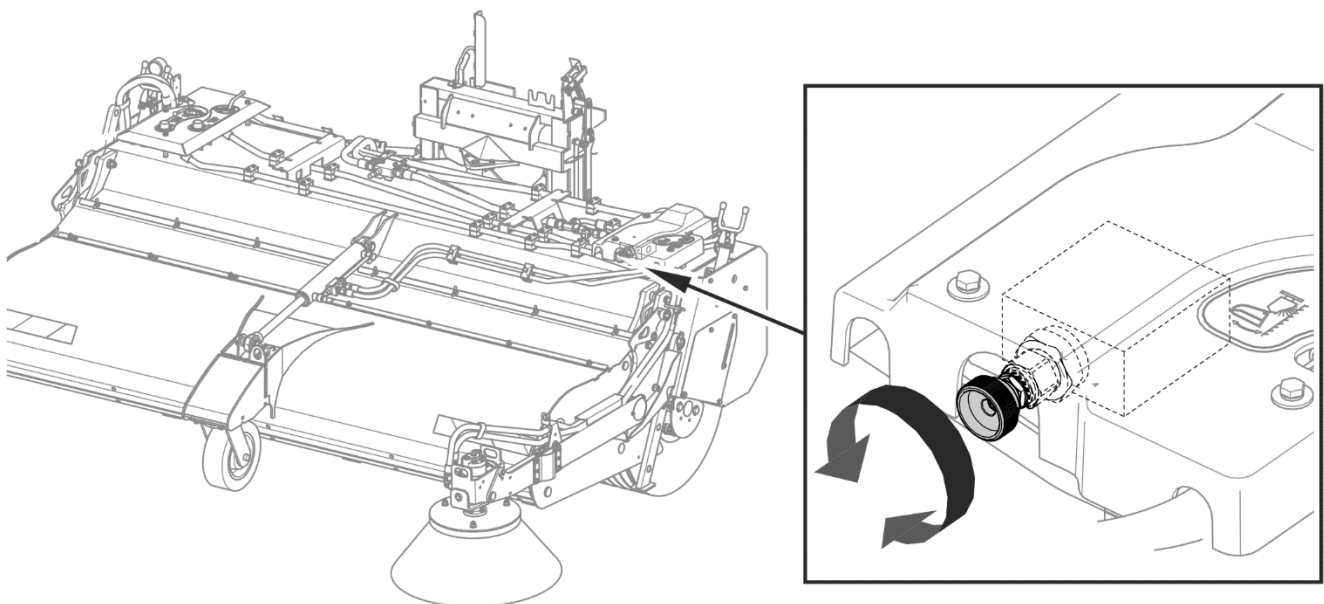


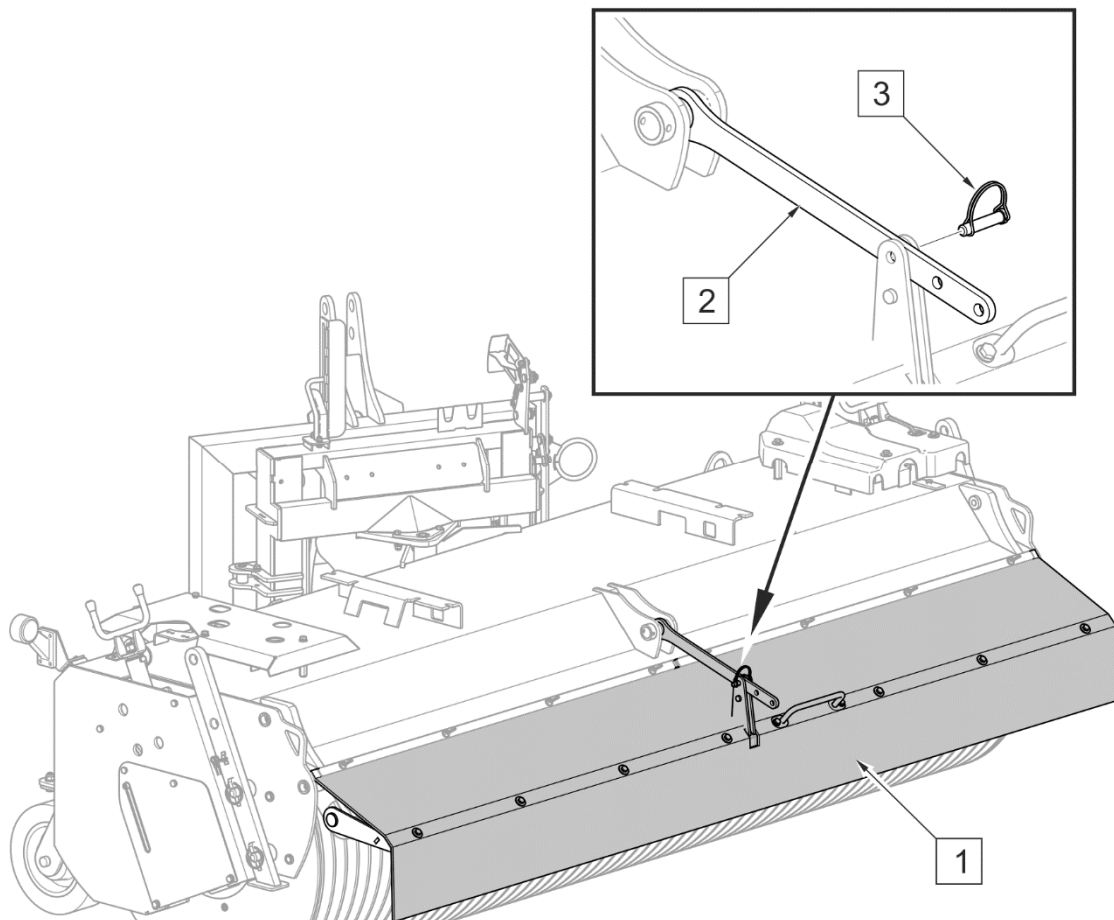
FIGURE 4.18 Flow regulator

TABLE 4.2 APPROXIMATE SETTING OF FLOW REGULATOR

OUTPUT OF HYDRAULIC SYSTEM SUPPLYING THE SWEEPER	SETTING OF FLOW REGULATOR KNOB (FIGURE 4.18)
60 l/min	Knob is maximally screwed in
90 l/min	Knob is screwed out by 1.5 turn
140 l/min	Knob is screwed out by 2.5 turn

ATTENTION

The flow regulator setting should be suitable for the output of the carrying vehicle's hydraulic system. If the flow regulator knob is excessively screwed out (FIGURE 4.18), rotation speed of the brushes will be reduced or the brushes will be even stopped. If the flow regulator knob is not screwed out, the rotation speed of the brushes may be excessive.

4.4.8 ROLLER BRUSH SHIELD**FIGURE 4.19** Roller brush shield

(1) - shield; (2) - strip; (3) - cotter pin

The sweeper without the waste tank (FIGURE 4.19) is equipped with adjustable shield (1) of roller brush. The shield is adjusted by changing the position of cotter pin (3) in the opening of strip (2).



ATTENTION

Check technical condition of the roller brush shield periodically and replace the shield if necessary.

4.5 DRIVING ON PUBLIC ROADS

When driving on public or private roads, respect the road traffic regulations, exercise caution and prudence. If the machine is operated on pavements, special attention should be paid to the bystanders likely to be near the working machine. Listed below are the key guidelines.

- Before moving off make sure that there are no bystanders, especially children, near the machine and the carrying vehicle. Take care that the driver has sufficient visibility.
- Make sure that the sweeper is correctly attached to the carrying vehicle, and linkage is properly secured.
- Permissible working speed, transport speed and maximum speed allowed by road traffic law must not be exceeded. Speed of travel should be adjusted to prevailing road conditions and other conditions.
- While driving on public roads, turn on the sweeper's clearance lamps (FIGURE 4.20).
- While working with the sweeper, turn on the orange beacon light (included in the carrying vehicle equipment).
- Avoid ruts, depressions, ditches or driving on roadside slopes. Driving across such obstacles could cause the machine and the carrying vehicle to suddenly tilt. Driving near ditches or canals is dangerous as there is a risk of the wheels sliding down the slope or the slope collapsing.
- Speed must be sufficiently reduced before making a turn or driving on an uneven road or a slope.

- When driving on uneven terrain with the machine raised, reduce speed due to dynamic loads and the risk of damaging the machine or carrying vehicle.
- When driving with raised machine, secure the carrying vehicle's linkage against falling or accidental dropping.

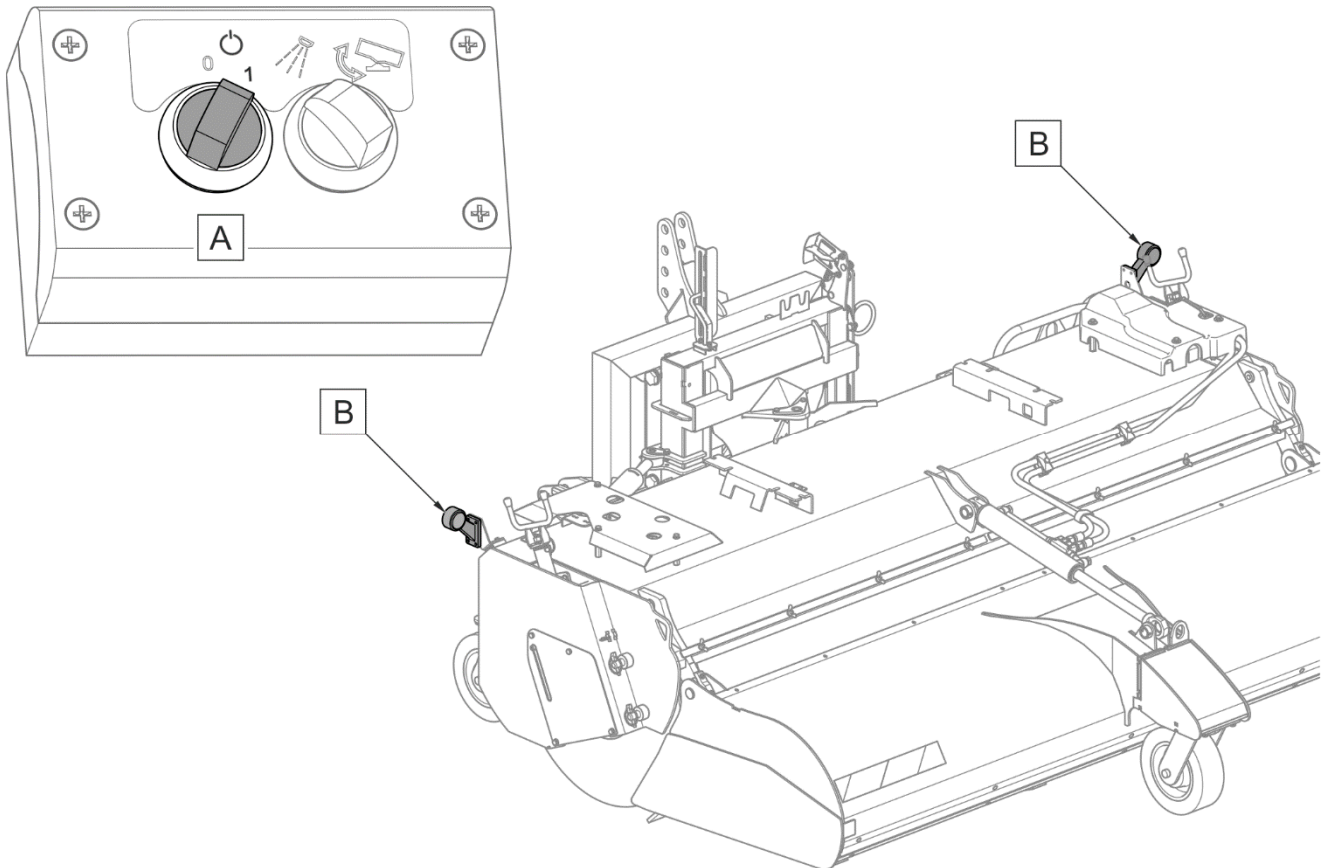


FIGURE 4.20 Clearance lights of the machine

(A) - clearance lights switch; (B) - clearance lights



ATTENTION

The sweeper's clearance lights do not turn on together with the carrying vehicle's lights. In order to turn on the sweeper's clearance lights (FIGURE 4.20), turn the main switch (A) to "1" position (ON).

4.6 UNHITCHING THE MACHINE FROM THE CARRYING VEHICLE

VEHICLE



DANGER

Before unhitching the machine from the carrying vehicle, turn off the carrying vehicle's engine, engage parking brake and secure cab against access of third persons.

The sweeper unhitched from the carrying vehicle should be supported on two parking stands and on wheels. If the sweeper's roller brush rests on the ground, the brush bristle may get deformed.

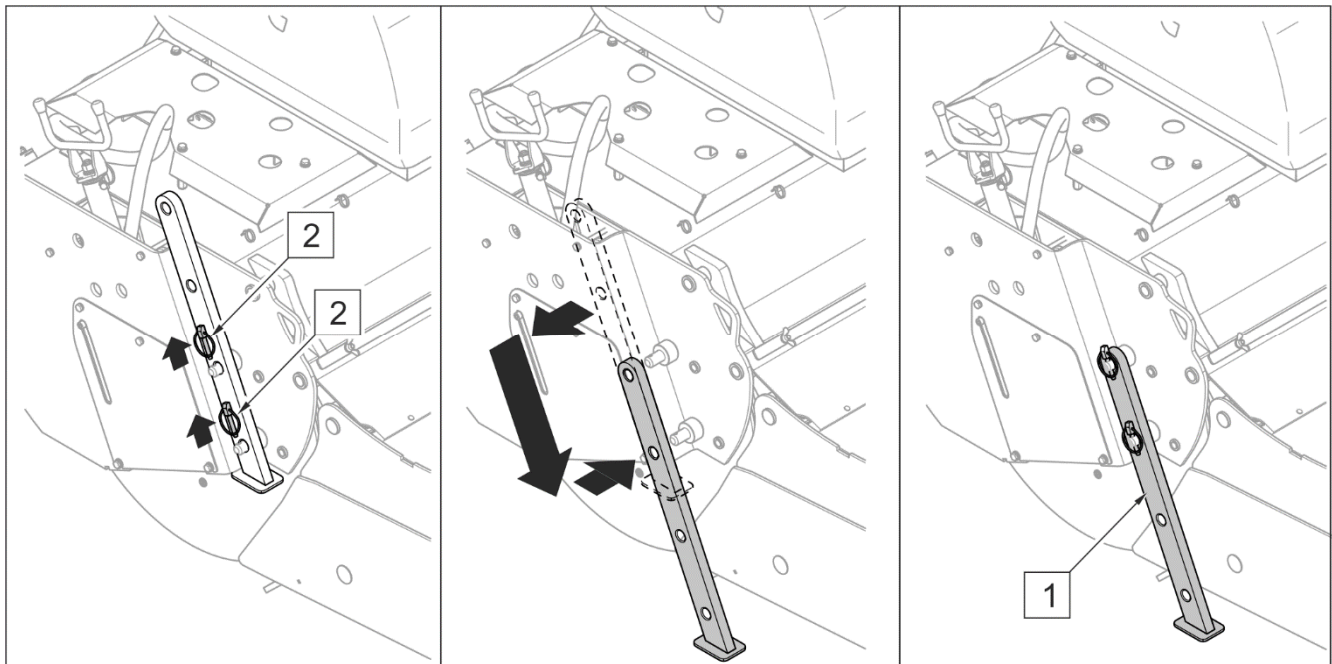


FIGURE 4.21 Parking stands

(1) - parking stand, (2) - linchpin, (3) - securing cotter pin

Parking stands (FIGURE 4.21) should be lowered to their lower position when the machine is hitched and raised on the carrying vehicle's linkage. To do this, take out securing cotter pins (2), move parking stand (1) to its lower position and secure with cotter pins. Repeat the procedure for the other parking stand.



DANGER

Reduce pressure prior to disconnecting the hydraulic system.

In order to disconnect the sweeper from the carrying vehicle, proceed as follows:

- Lower the parking stands (FIGURE 4.21).
- Lower the sweeper until it fully rests on the ground.
- Switch off engine, remove key from ignition and engage parking brake.
- Reduce residual pressure in the hydraulic system by moving appropriate lever controlling the carrying vehicle's hydraulic circuit.
- Disconnect hydraulic conduit plugs and electric lead plugs from the carrying vehicle and secure with stoppers. Place hydraulic conduit plugs in the bracket on the frame (FIGURE 4.22).
- Disconnect the linkage and drive the carrying vehicle away from the machine.



ATTENTION

Do NOT unhitch the sweeper from the carrying vehicle when the parking stands are not lowered.

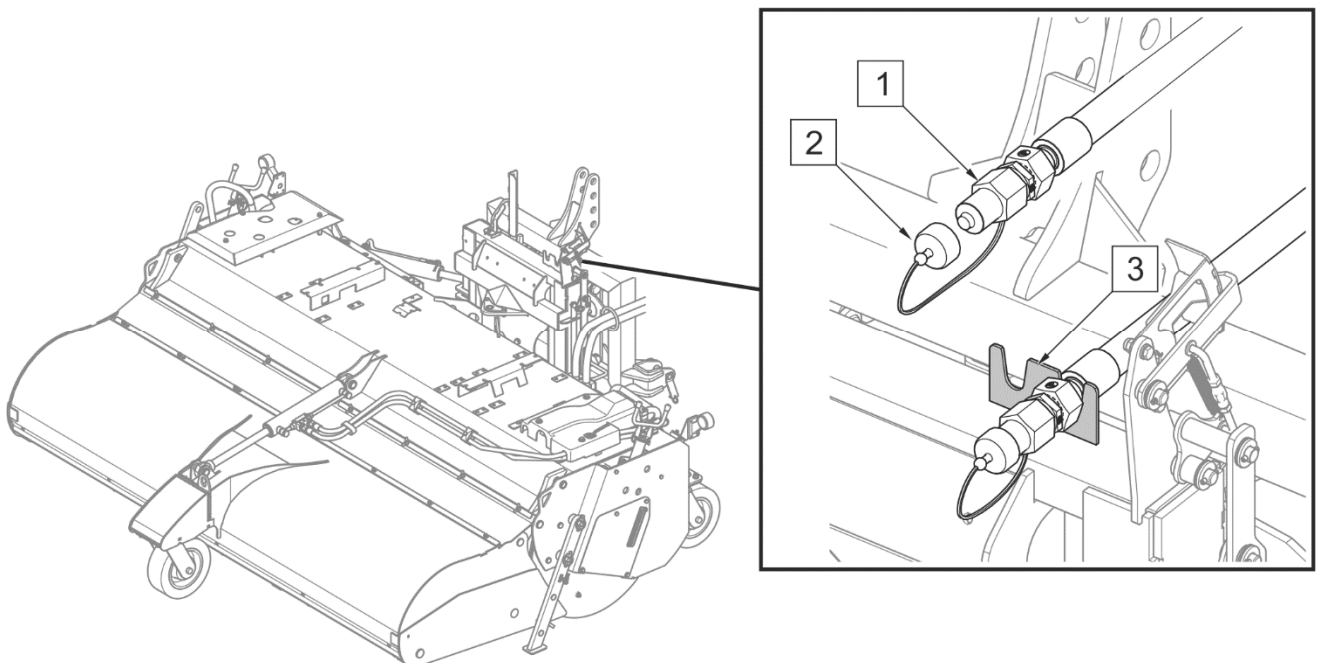


FIGURE 4.22 Protection of plugs after disconnection from the carrying vehicle


(1) - hydraulic conduit quick coupler; (2) - stoppers of hydraulic conduit quick couplers;
(3) - bracket

SECTION

5

MAINTENANCE

5.1 ADJUSTMENT OF ROLLER BRUSH

 **ATTENTION**
Adjustment of roller brush may be performed only when the carrying vehicle's engine is turned off.

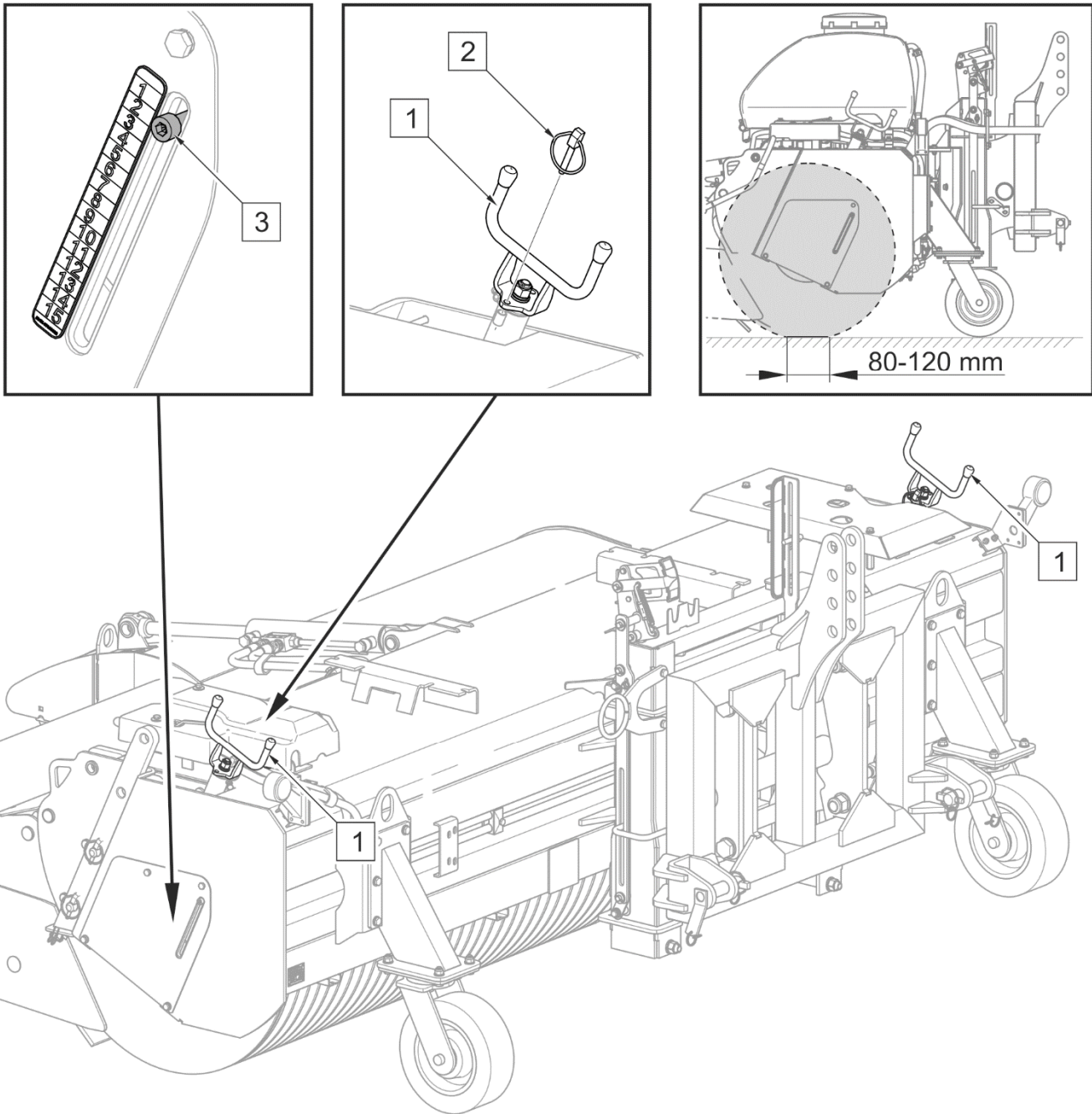


FIGURE 5.1 Adjustment of brush pressure

(1) - brush height adjustment knob; (2) - securing cotter pin; (3) - brush position indicator

Proper adjustment of brush pressure ensures efficient sweeping, uniform wear and long service life of the brush. When setting the brush, take its wear into account. The width of brush ground contact surface (FIGURE 5.1) should be in the range from 80 to 120 mm. Knob (1) of the bolt mechanism located on both sides of the machine enables smooth adjustment of brush position. Take out securing cotter pin (2) before the adjustment. The brush pressure on the right and left side of the machine should be the same. Indicator (3) facilitates the adjustment. Uneven adjustment of the brush pressure on the right and left side of the machine causes uneven wear of the brush and may cause damage to the machine.



ATTENTION

Before driving over obstacles higher than 60mm, check position of roller brush. If the brush is lowered below position "9" on the indicator, the roller brush shaft may collide with the obstacle.

5.2 ADJUSTMENT OF THE SIDE BRUSH



ATTENTION

Adjustment of side brush may be performed only when the carrying vehicle's engine is turned off.

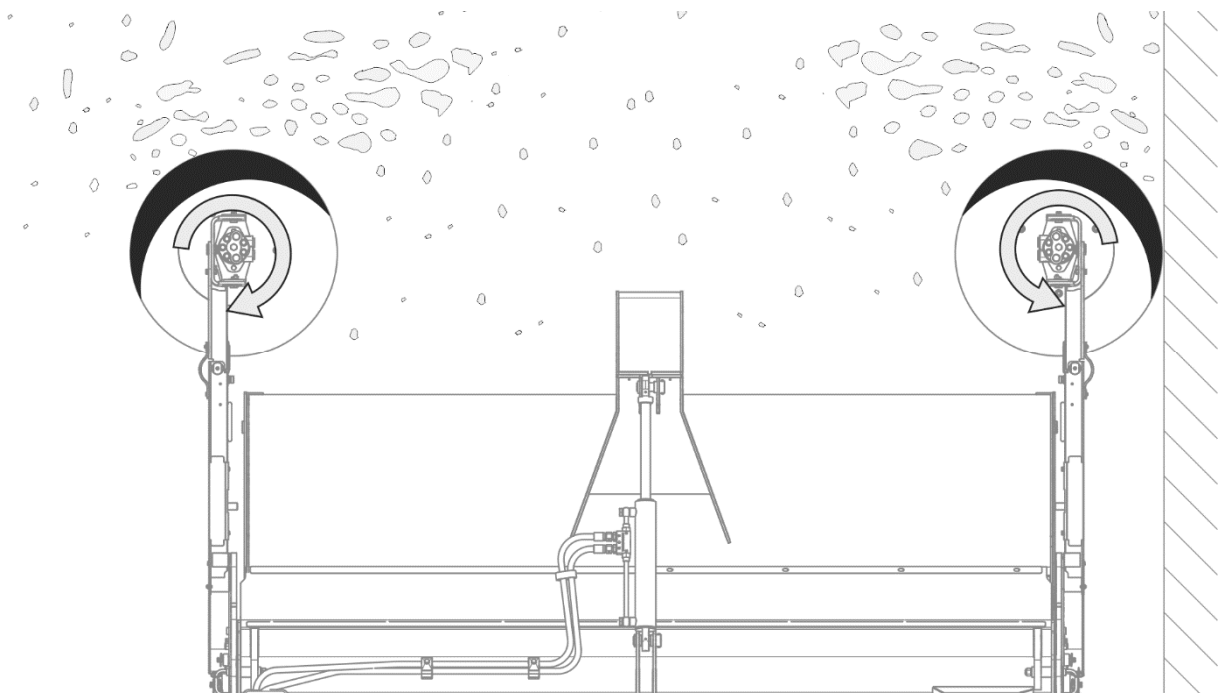


FIGURE 5.2 Correct setting of the side brush

Correctly positioned side brush head should touch the surface only with a section of its circumference in such a manner as to ensure that waste is directed to the inside of the sweeper, in front of the roller brush. Shaded areas on diagram (FIGURE 5.2) indicate sections of correctly set brushes which touch the surface.

The following parameters affect the correct position of side brush (FIGURE 5.6 FIGURE 5.2):

- Adjustment of pressure limiter (FIGURE 5.3).
- Adjustment of longitudinal tilt (FIGURE 5.4).
- Adjustment of lateral tilt (FIGURE 5.5).
- Adjustment of side tilt (FIGURE 5.6).

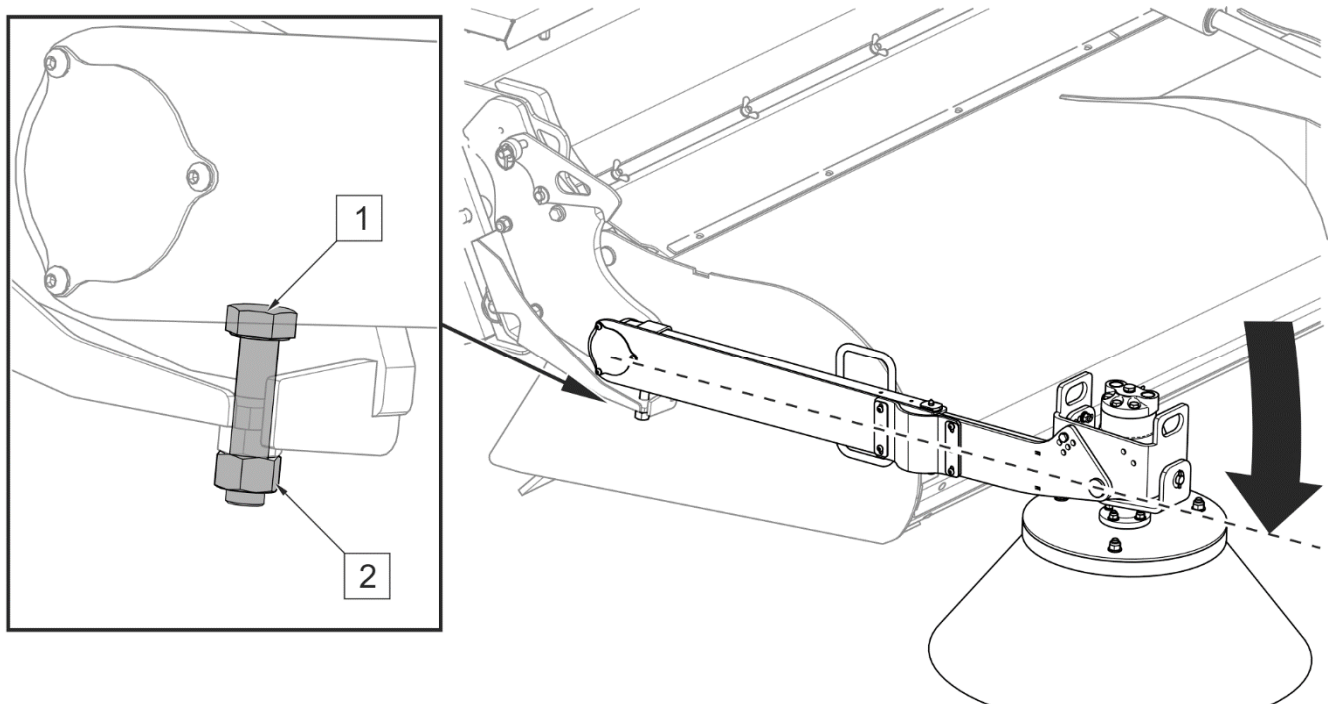
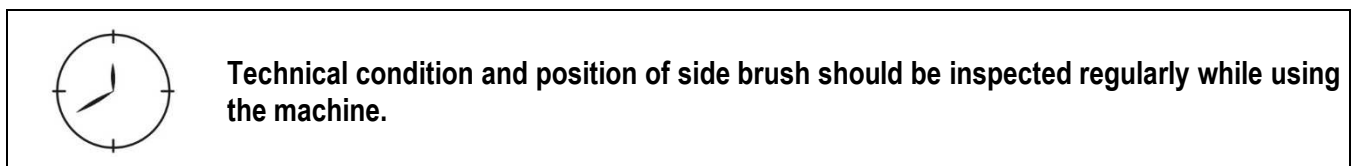


FIGURE 5.3 Adjustment of pressure limiter of side brush

(1)- limiter bolt; (2)- counter nut;

During machine operation, the brush pressure is limited by limiter bolt (1). To adjust the side brush pressure (FIGURE 5.3), loosen counter nut (2) and, if necessary, screw in or screw out limiter bolt (1) slightly. Check the effect of the adjustment and tighten counter nut (2).

As the side brush wears down, adjust the pressure limiter in a proper manner (FIGURE 5.3)

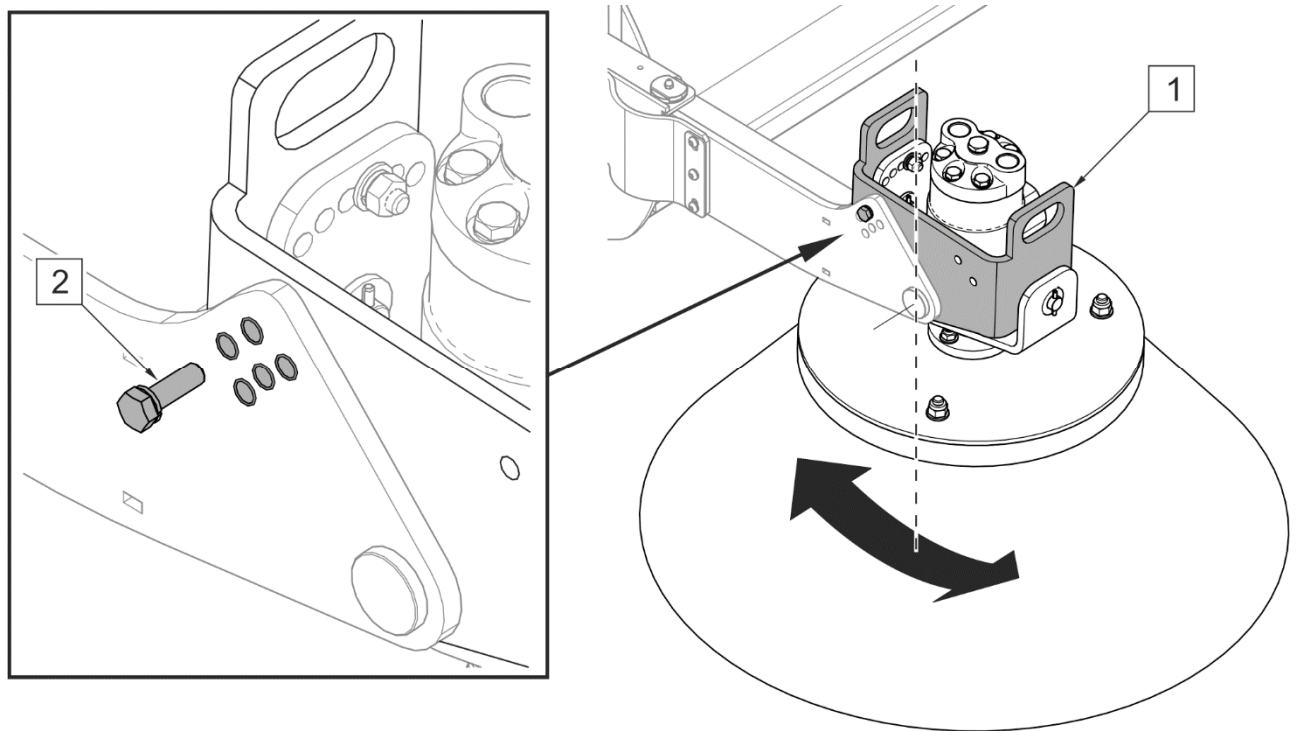


FIGURE 5.4 Adjustment of longitudinal tilt

(1) - brush head bracket, (2) - longitudinal tilt adjusting bolt

Adjustment of longitudinal tilt of side brush (FIGURE 5.4) involves changing the position of adjusting bolt (2) in bracket holes.

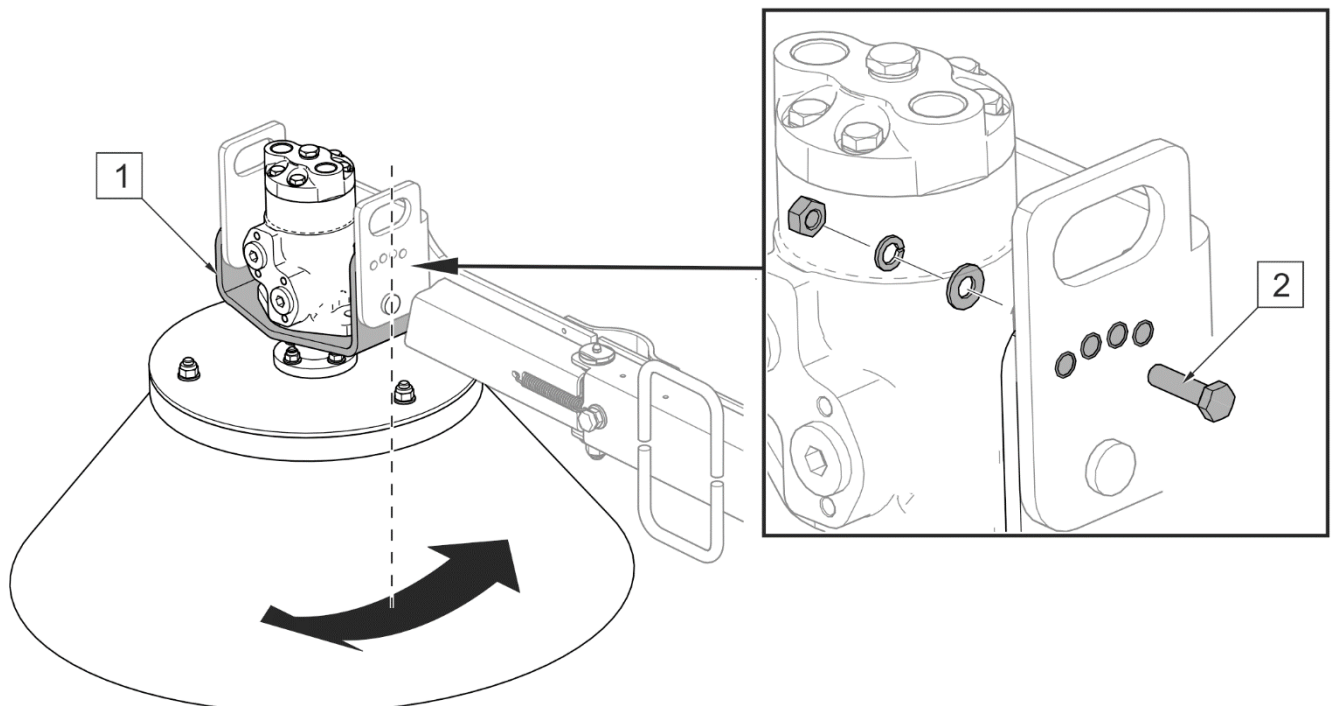


FIGURE 5.5 Adjustment of lateral tilt

(1) - brush head bracket; (2) - adjusting bolt

To change the lateral tilt angle (FIGURE 5.5), unscrew adjusting bolt (2), rotate bracket (1) properly and install bolt (2) in a suitable hole in the bracket.

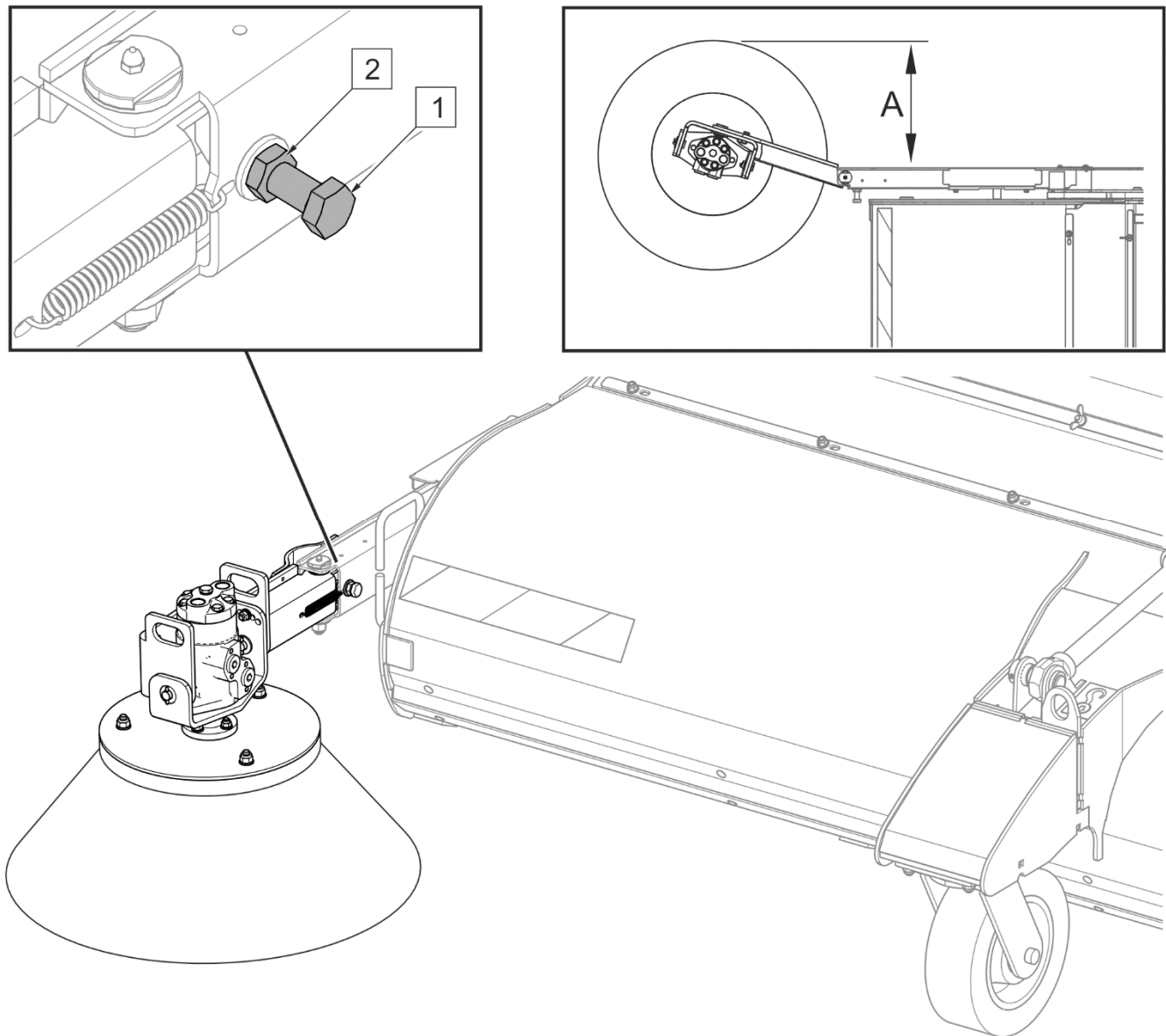


FIGURE 5.6 Adjustment of side tilt

(1) - limiter bolt; (2) - counter nut; (A) = 320 mm

If the sweeper is raised, the side brush arm is folded to the inside of the machine by the tensioning spring. During machine operation, the side brush is tilted to the outside (FIGURE 5.6). Properly adjusted side brush should tilt beyond the outline of the machine to the distance of $A=320$ mm (for a new brush), measured from the brush side to the arm. Range of horizontal movement of the side brush is limited with bolt (1) secured with counter nut (2).

5.3 INSPECTION AND REPLACEMENT OF ROLLER BRUSH

5.3.1 DISMOUNTING THE ROLLER BRUSH



Technical condition of the roller brush should be inspected regularly while using the machine.

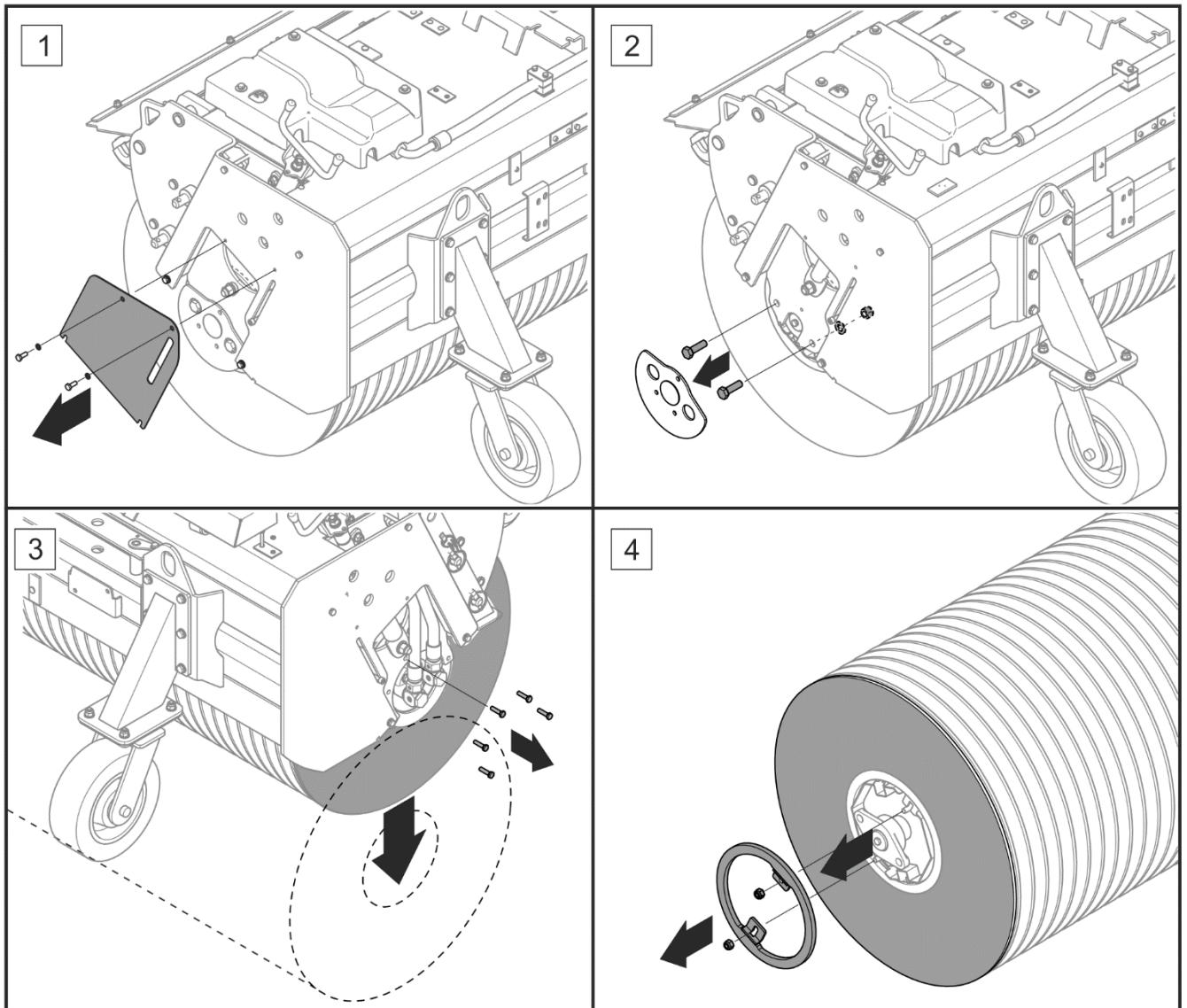


FIGURE 5.7 Replacing the roller brush

(1,2,3,4) - sequence of actions while dismounting the roller brush

Excessively worn or damaged brush should be replaced. Before replacing the roller brush, raise the sweeper to achieve the clearance of $800 \div 1\ 000$ mm under the frame and secure the sweeper in this position. Lower the roller brush to its lowest position using the height

adjustment knobs (FIGURE 5.1). The waste tank can be raised and locked in order to facilitate the brush dismounting. Before replacing the roller brush, make sure that the sweeper is disconnected from the carrying vehicle's hydraulic system and that the residual pressure in the hydraulic system is reduced.

**DANGER**

The roller brush may drop down after unscrewing the bearing assembly (2) on the left side of the machine and the bolts (3) fixing the shaft with the rising mechanism (FIGURE 5.7) .

In order to replace the roller brush (FIGURE 5.7), proceed as follows:

1. Dismount the side covers on both sides of the machine.
2. Dismount the bearing shield and unscrew the bolts fixing the bearing assembly on the left side of the machine.
3. Unscrew bolts (5 pcs.) fixing the shaft with the rising mechanism on the right side of the brush. Lower the brush.
4. Dismount end ring on the left side of the brush and dismount individual brush elements from the shaft.

Installation of the complete brush in the machine should be performed in reverse order.

5.3.2 ROLLER BRUSH WITH STRAIGHT SEGMENTS

The roller brush consists of individual segments which should be installed on the shaft in a proper manner before the brush is mounted in the machine (FIGURE 5.8). In case of hard and very hard brush, start and finish installing the segments on the shaft with the external segment (D). When assembling the hard brush, install segments (A) and (C) alternately on the shaft. Install spacer rings (2) (60 rings in total) between each straight segment of the brush. After installing all the segments, mount the end ring (3) on the end of the shaft. Brushes having various parameters and designed for various applications are available depending on the customer's requirements. Types of straight segments are given in (TABLE 5.1)

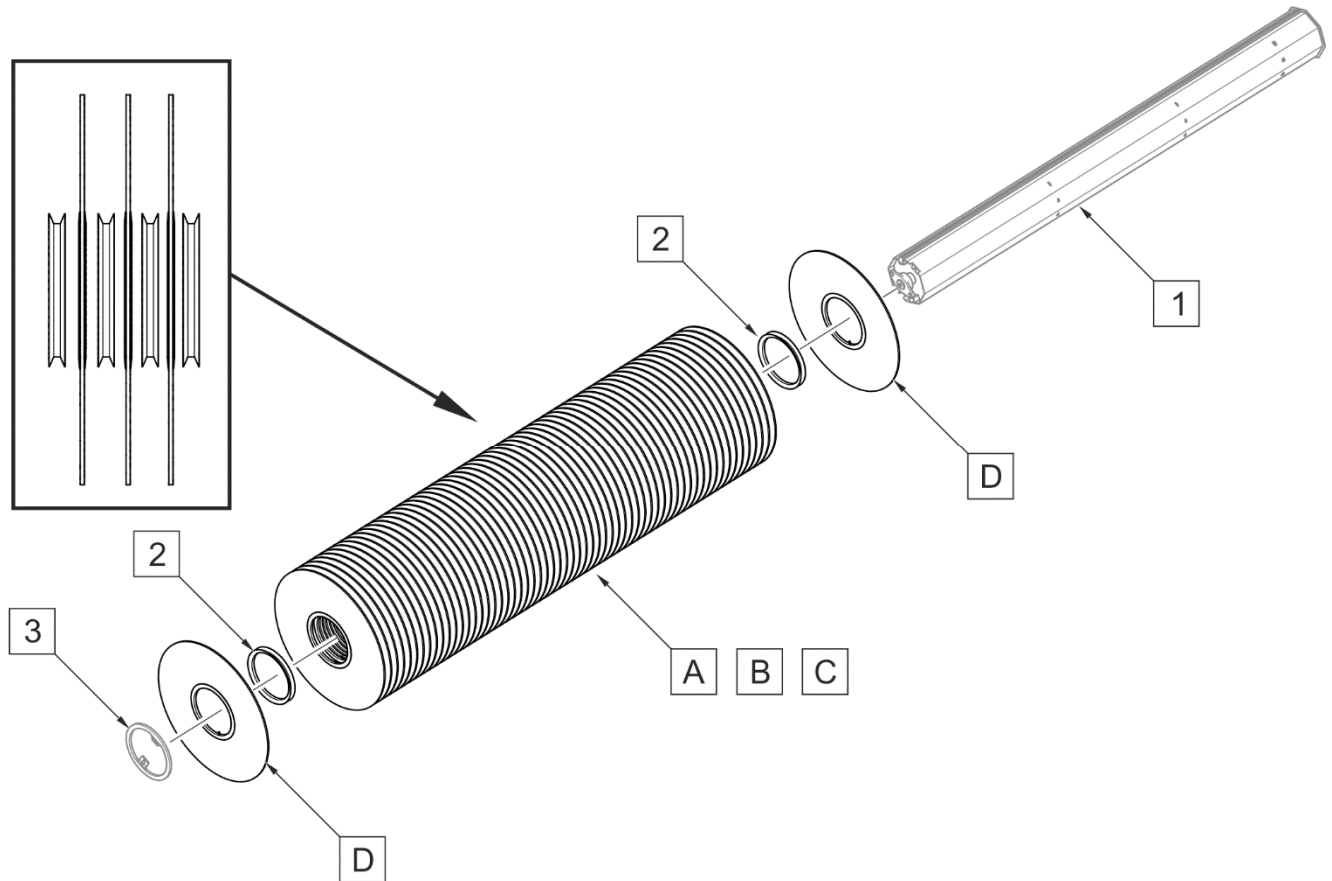


FIGURE 5.8 Roller brush with straight segments

(1) - shaft, (2) - spacer ring; (3) - end ring; (A),(B),(C) - brush segments depending on hardness; (D) - external segments

TABLE 5.1 List of components of straight segment roller brush

HARDNESS OF ROLLER BRUSH	BRUSH SEGMENTS (FIGURE 5.8)	QUANTITY	PART NUMBER OF SEGMENT
Medium (plastic 2x3mm)	A	63	531N-00000010-01
Soft (plastic 1.6mm)	B	63	531N-00000010
Hard (plastic 2x3mm+flat wire)	A	30	531N-00000010-01
	C	31	531N-00000010-02
	D	2	531N-00000010-01
Very hard (flat wire)	C	61	531N-00000010-02
	D	2	531N-00000010-01

5.3.3 ROLLER BRUSH WITH BENT SEGMENTS

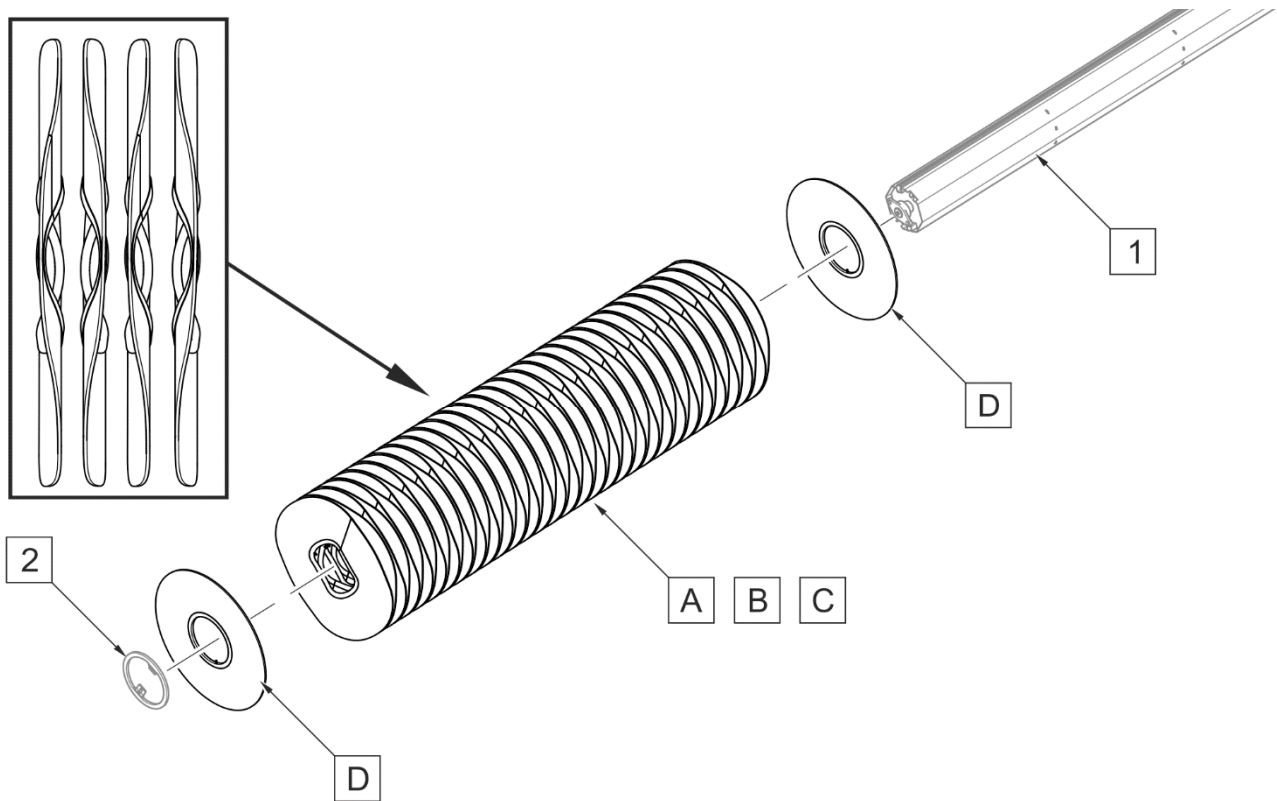


FIGURE 5.9 Roller brush, so-called "honeycomb"

(1) - shaft, (2) - end ring; (A),(B),(C) - bent brush segments, (D) - straight external segments

TABLE 5.2 List of components of bent segment roller brush

HARDNESS OF ROLLER BRUSH	BRUSH SEGMENTS (FIGURE 5.9)	QUANTITY	PART NUMBER OF SEGMENT
Medium (plastic 2x3mm)	A	59-60	531N-00000012-01
	D	2	531N-00000010-01
Soft (plastic 1.6mm)	B	59-60	531N-00000012
	D	2	531N-00000010-01
Hard (plastic 2x3mm+flat wire)	A	29-30	531N-00000012-01
	C	30	531N-00000012-02
	D	2	531N-00000010-01
Very hard (flat wire)	C	59-60	531N-00000012-02
	D	2	531N-00000010-01

In case of the roller brush consisting of bent segments (FIGURE 5.9), start and finish installing the segments on the shaft with the external straight segment (D). Install bent segments (A,B,C) in such a manner as to ensure that they form so-called "honeycomb". In case of hard brush, install segments (A) and (C) alternately. Do not use spacer rings between the brush segments. After installing all the segments, mount the end ring (2) on the end of the shaft. Types of bent segments are given in (TABLE 5.2)

5.4 REPLACING THE SIDE BRUSH



Technical condition and position of side brush should be inspected regularly while using the machine.

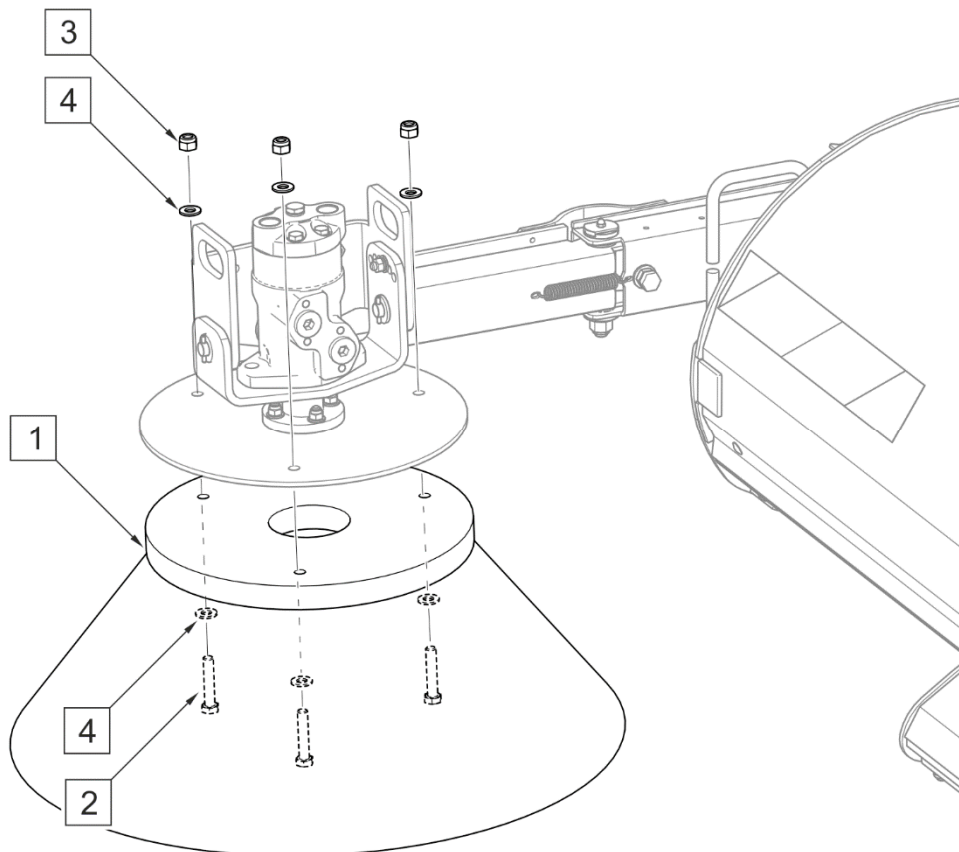


FIGURE 5.10 Replacing the side brush

(1) - disk brush; (2) - M10x50-8.8 bolt; (3) - M10-8 nut; (4) - washer 10

Excessively worn or damaged brush should be replaced. List of side brushes categorized according to their hardness is given in TABLE 5.3

TABLE 5.3 TYPES OF SIDE BRUSHES CATEGORIZED ACCORDING TO THEIR HARDNESS

ITEM	SPECIFICATION	PART NUMBER
1	Medium brush (<i>plastic 2x3 mm+flat wire</i>)	531N-14000006-01
2	Soft brush (<i>plastic 2x3 mm</i>)	531N-14000006
3	Hard brush (<i>flat wire</i>)	531N-14000006-02

5.5 REPLACING THE GUIDES OF THE ROLLER BRUSH HEIGHT ADJUSTMENT MECHANISM



Technical condition of the guides should be inspected regularly while using the machine.

If the guides (FIGURE 5.11) of the roller brush adjustment mechanism are excessively worn, dismount them and turn on the other side or replace in the following manner:

- Dismount the roller brush (*5.3 INSPECTION AND REPLACEMENT OF ROLLER BRUSH*)
- Unscrew slides (1) from screw jacks (4) of the brush height adjustment mechanism.
- Unscrew bolts securing (3) guides.
- Slide out the slide (1) from guides (2).
- Slide the guides out from the frame.
- Turn the guides on the other side or replace with new ones.
- Install in reverse order.

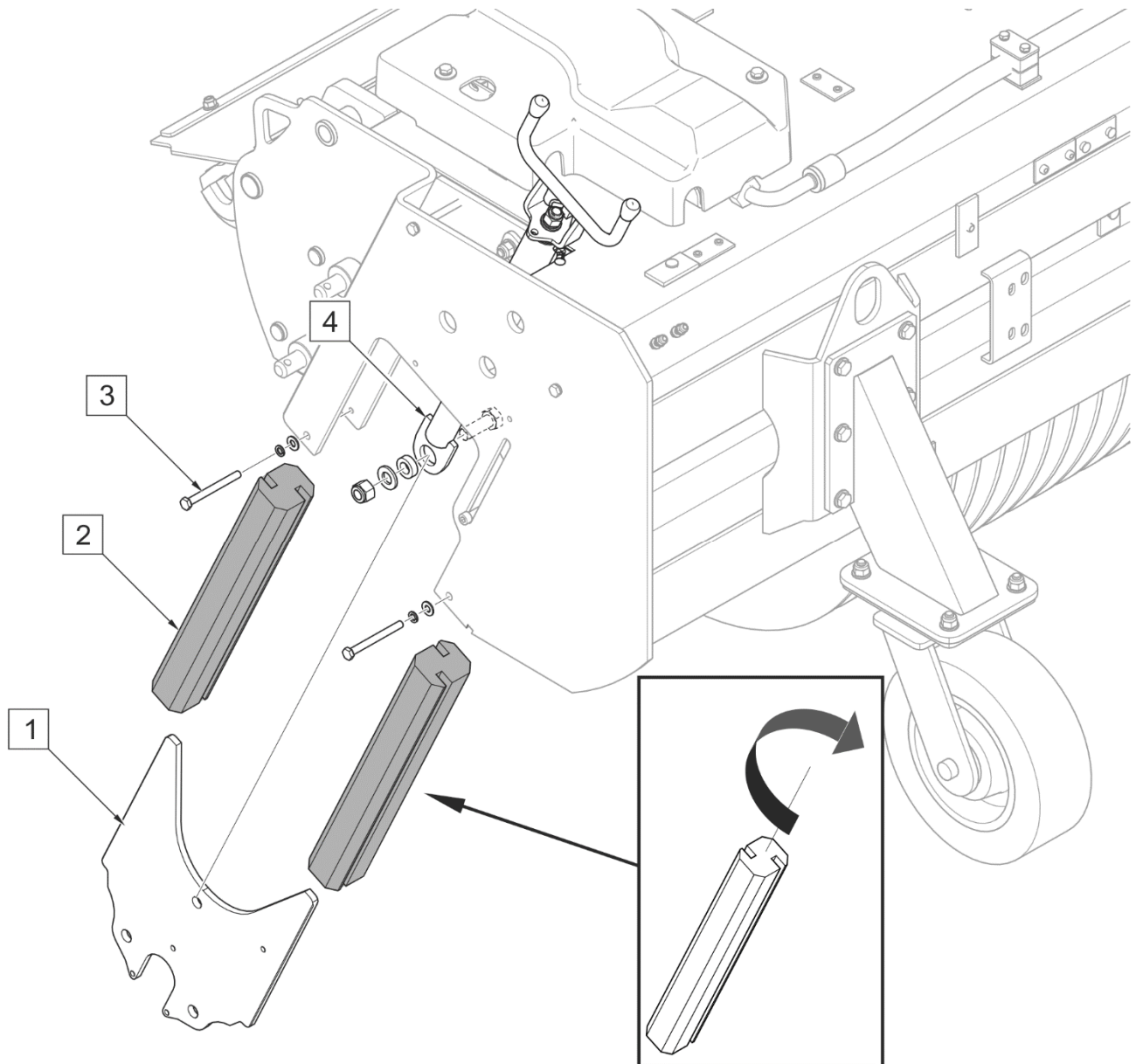


FIGURE 5.11 Replacing the guides of the roller brush height adjustment mechanism


(1) - slide; (2) - guide; (3) - securing bolt; (4) - screw jack

5.6 SPRINKLER SYSTEM MAINTENANCE

Maintenance of the sprinkler system involves periodic inspection of the system and cleaning of water filters.

Before the first use, check operation of sprinklers, especially the setting of spray nozzles. The roller brush nozzles should be positioned so that during sweeper operation water is sprayed through the slit, perpendicularly to the sweeping direction (tangentially to the roller brush). The sprinkling nozzles of the side brush should spray water in front of the brush. The roller brush sprinklers (FIGURE 5.12) are adjusted by means of the sprinkler strip lever (1).

Adjustment of the side brush sprinkler involves loosening of fixing bolts and proper positioning of bracket (1).

 As the brushes wear down, correct the position of the sprinklers.

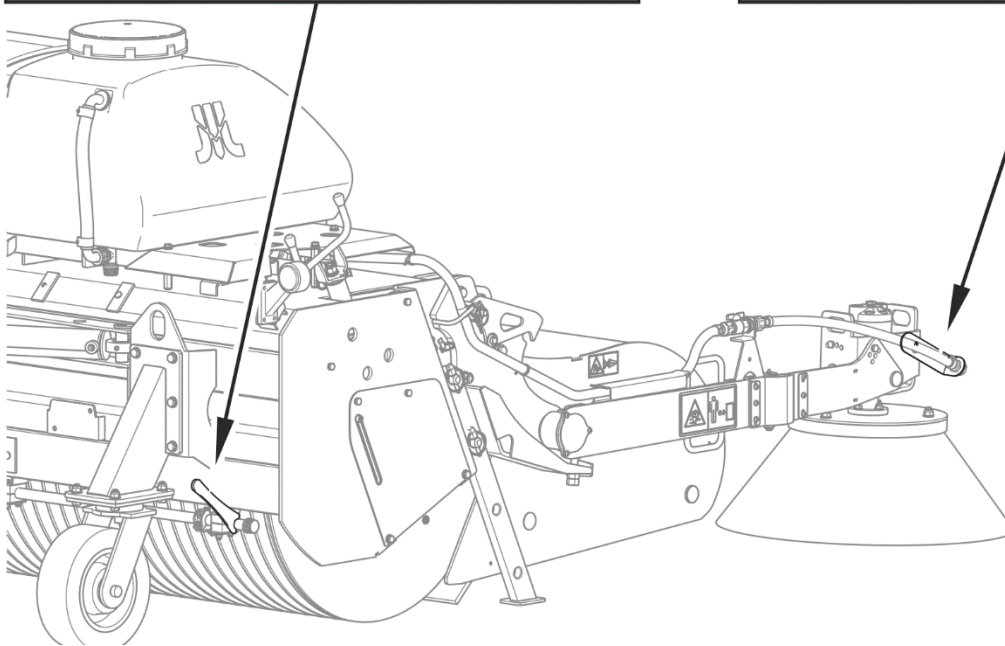
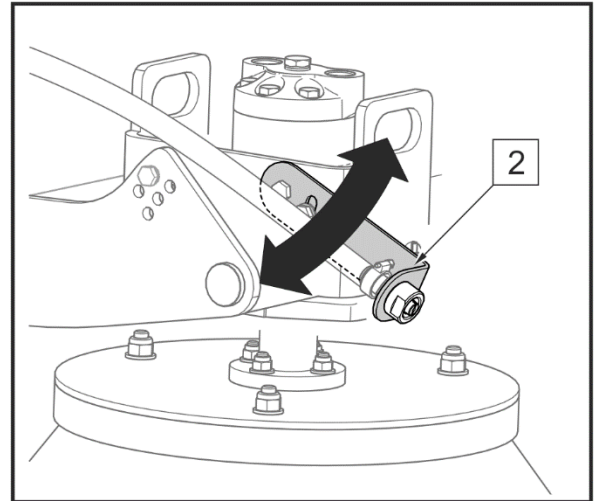
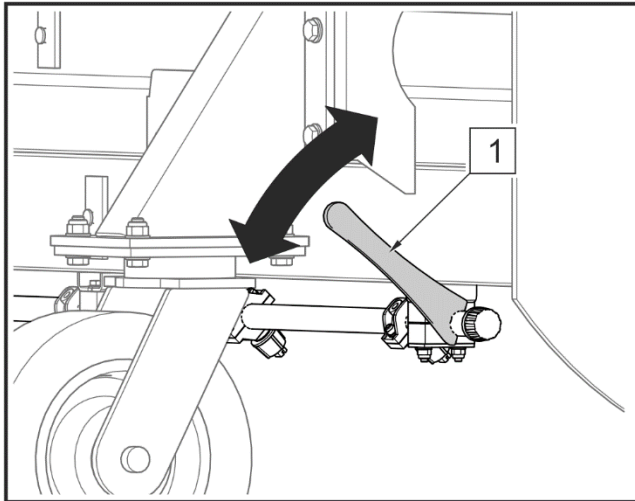



FIGURE 5.12 Adjustment of sprinklers

(1) - sprinkler strip lever; (2) - brush sprinkler bracket

 **ATTENTION**
If there is a leakage in the sprinkler system, water is sprayed in a wrong manner.

ATTENTION

If temperature drops below 0°C, the machine should be stored in a building at a temperature above 0°C, because there is a risk that water in the water pump will freeze and damage the pump. Do not start frozen water pump.

If the machine must be stored in temperatures below 0°C, drain water from the tank and the connector pipes and blow the water pump through with compressed air.

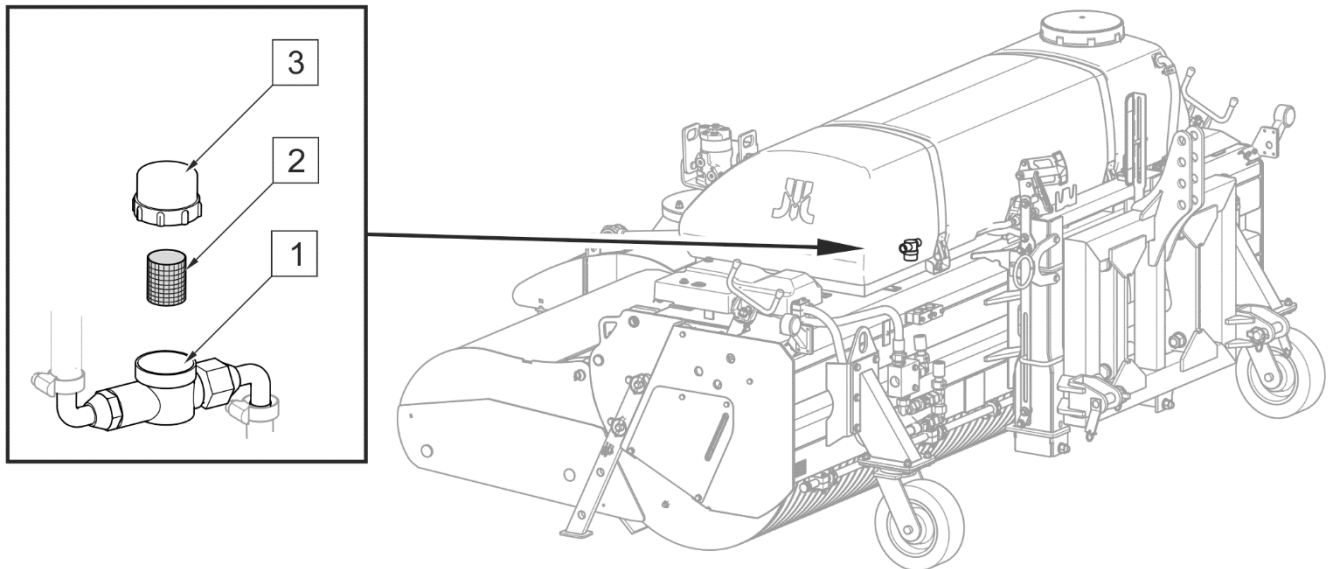


FIGURE 5.13 Filter in water tank

(1) - filter housing; (2) - mesh cartridge; (3) - cover

The mesh cartridge filter (2) installed in front of the water tank should be periodically checked and cleaned (FIGURE 5.13). To clean the mesh cartridge (2), drain water, remove bands securing water tank and raise the tank above the frame. Unscrew cover (3), remove cartridge (2) from housing (1) and wash it with water under pressure or clean with compressed air. Install cartridge, tighten filter housing and check tightness of connection.



Technical condition of the sprinkler system should be inspected regularly while using the machine. Frequency of filter cleaning depends on cleanliness of water.

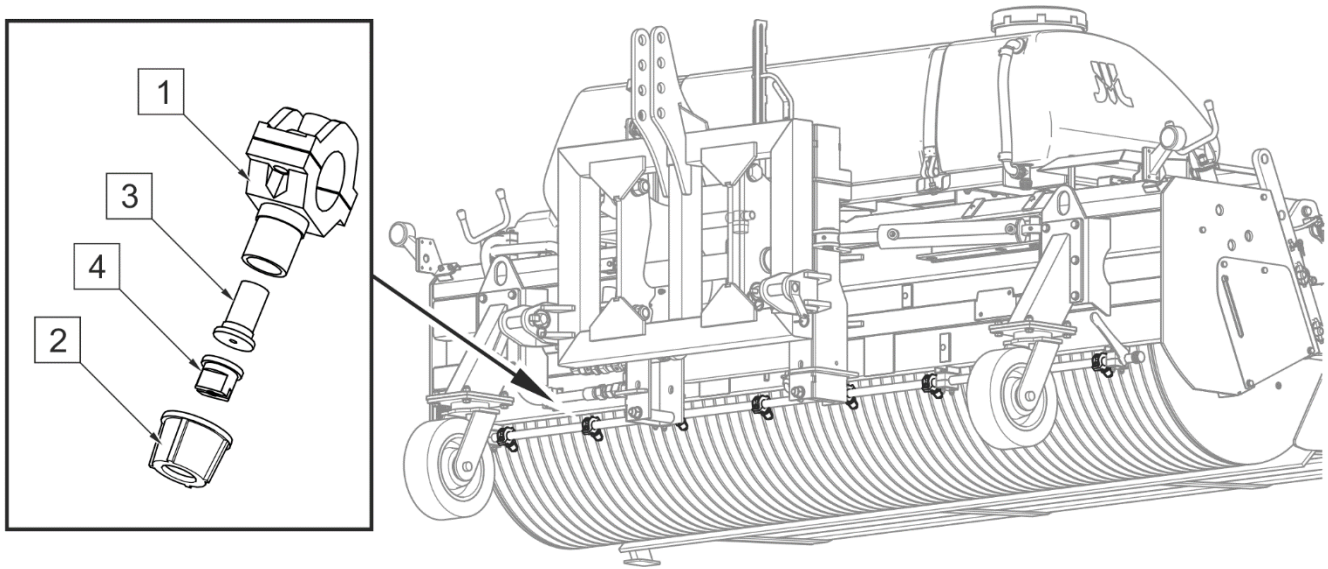



FIGURE 5.14 Filters of sprinklers

(1) - holder; (2) - nut; (3) - filter with a check valve; (4) - spray nozzle

There is a filter (FIGURE 5.14) inside each sprinkler. In order to clean the sprinkler filter (3), unscrew housing and wash or blow the filter with compressed air. Before installing the filter, confirm that the spray nozzle is not blocked. Check technical condition of sprinklers and, if necessary, replace them.

In case of wrong operation of the sprinkler system, first check water level in the tank, operation of electrical system and cleanliness of filters.

5.7 ELECTRICAL SYSTEM MAINTENANCE

	<p>DANGER</p> <p>Do not independently repair electrical system, except items described in chapter ELECTRICAL SYSTEM MAINTENANCE. All electrical system repairs must be performed only by suitably qualified personnel.</p>
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Electrical system maintenance involves periodical inspection of the control system and clearance lights.

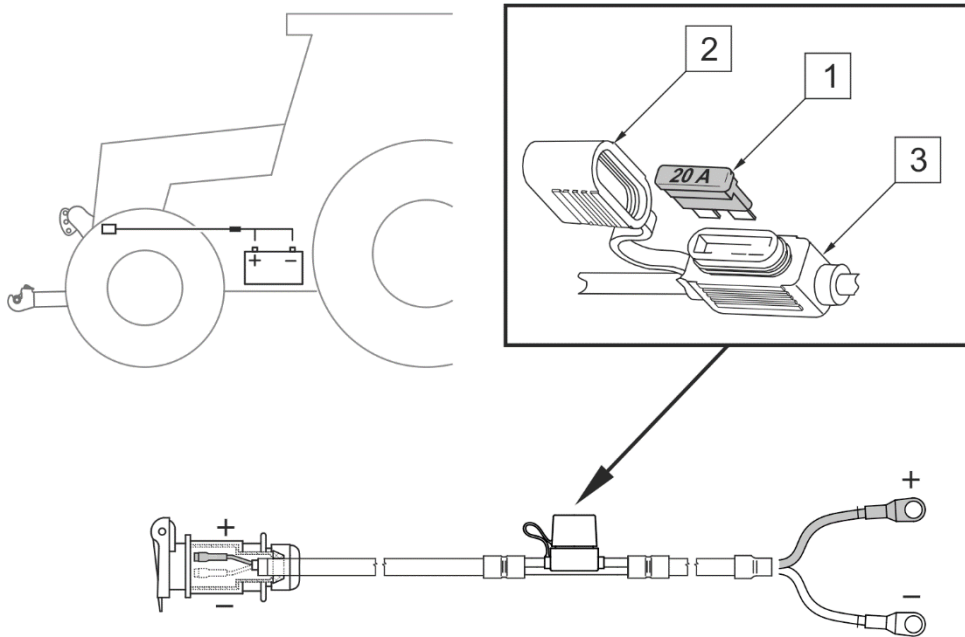


FIGURE 5.15 Fuses of electrical system

(1) - 20A UNIVAL fuse ; (2) - cover; (3) - housing

There is a fuse (1) on the supply conduit (+) of the electrical system (FIGURE 5.15). To check the fuse, remove cover (2) and take the fuse out of the housing (3). Blown fuse should be replaced with a new one (UNIVAL 20A).

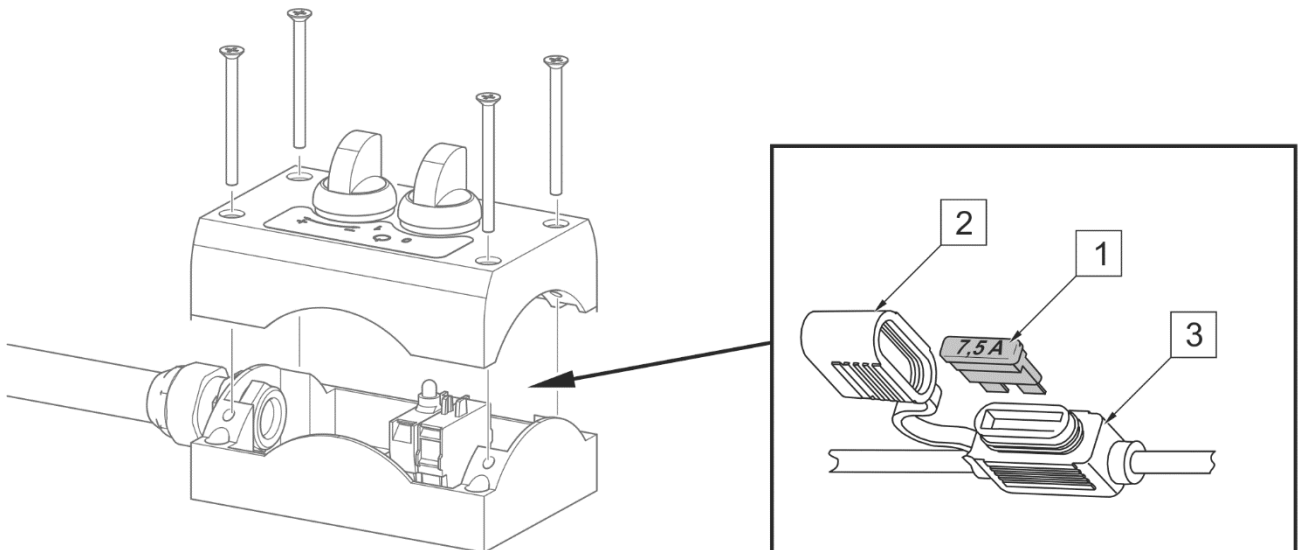


FIGURE 5.16 Fuse in control panel

(1) - UNIVAL 7.5 A fuse ; (2) - cover; (2) - housing

Electrical control system of the sweeper is equipped with UNIVAL 7.5A fuse (1) located inside the control panel (FIGURE 5.16). Damaged fuse should be replaced with a new one.

The sweeper's clearance lights are maintenance-free LED lights. Damaged lights should be replaced with new ones.

5.8 HYDRAULIC SYSTEM OPERATION



DANGER

Do not repair hydraulic system on your own. All hydraulic system repairs must be performed only by suitably qualified personnel.

The duties of the operator connected with the hydraulic system include:

- checking tightness of cylinders hydraulic connections,
- checking technical condition of hydraulic lines and quick couplers;



DANGER

Before commencing whatever work on hydraulic system reduce the pressure in the system.



ATTENTION

Before you begin to operate the sweeper, visually inspect the hydraulic system components.



DANGER

During work on hydraulic system, use the appropriate personal protection equipment i.e. protective clothing, footwear, gloves and eye protection. Avoid contact of skin with oil.

The hydraulic system of new sweeper is factory filled with HL32 hydraulic oil. Because of its composition the oil applied is not classified as a dangerous substance, however long-term action on the skin or eyes may cause irritation. In the event of contact of oil with skin wash the place of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene). Contaminated clothing should be changed to prevent access of oil to skin. In the event of contact of oil with eye, rinse with large quantity of water and in the event of the occurrence of irritation consult a doctor. Hydraulic oil in normal conditions is not harmful to the respiratory tract. A hazard only occurs when oil is strongly atomised (oil vapour), or in the case of fire during which toxic compounds may be released.



The condition of hydraulic system should be inspected regularly while using the machine.

Hydraulic conduits should be replaced after 4 years of machine use.



DANGER

Oil fires should be quenched with carbon dioxide (CO₂), foam or extinguisher steam. Do NOT use water for fire extinguishing!

Spilt oil should be immediately collected and placed in a marked tight container. Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

TABLE 5.4 HL32 HYDRAULIC OIL CHARACTERISTICS

ITEM	NAME	VALUE
1	ISO 3448VG viscosity classification	32
2	Kinematic viscosity at 40°C	28.8 – 35.2 mm ² /s
3	ISO 6743/99 quality classification	HL
4	DIN 51502 quality classification	HL
5	Flash point, °C	Above 210°C
6	Maximum operating temperature, °C	80


The hydraulic system should be completely tight sealed. Inspect the seals when the hydraulic cylinder is completely extended. If oil is found on hydraulic cylinder body, check origin of leak. Minimum leaks are permissible with symptoms of "sweating", however in the event of noticing leaks in the form of "droplets" stop using the machine until faults are remedied.


In the event of confirmation of an oil leak on hydraulic conduit connections, tighten connections, and if this does not remedy faults then change conduit or connection elements. Change of sub assemblies is equally required in each instance of mechanical damage.



ATTENTION

The hydraulic system is vented automatically during machine operation.

	<p>The condition of hydraulic system should be inspected regularly while using the machine.</p> <p>Hydraulic conduits should be replaced after 4 years of machine use.</p>
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	<p>DANGER</p> <p>Keep a safe distance from hot hydraulic system components. Risk of burn injuries caused by hot hydraulic oil escaping from the system.</p>
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5.9 LUBRICATION

TABLE 5.5 Lubrication points and lubrication frequency

ITEM	NAME	NUMBER OF LUBRICATION POINTS	TYPE OF GREASE	LUBRICATION FREQUENCY
A	Bolt of roller brush pressure adjustment mechanism	2	grease	50 hours
B	Eye of waste tank cylinder	2	grease	50 hours
C	Eye of hydraulic steering system cylinder	2	grease	50 hours
D	Pin of side brush rising arm*	2*	grease	20 hours
E	Central pin	2	grease	50 hours
F	Wheels	2 (3)*	grease	20 hours
G	Side brush tilt pin*	2*	grease	20 hours
H	Roller brush bearing	1	grease	20 hours

* – depending on the machine version

Marking description in Item column (TABLE 5.5) conforms with numbering shown (FIGURE 5.17)

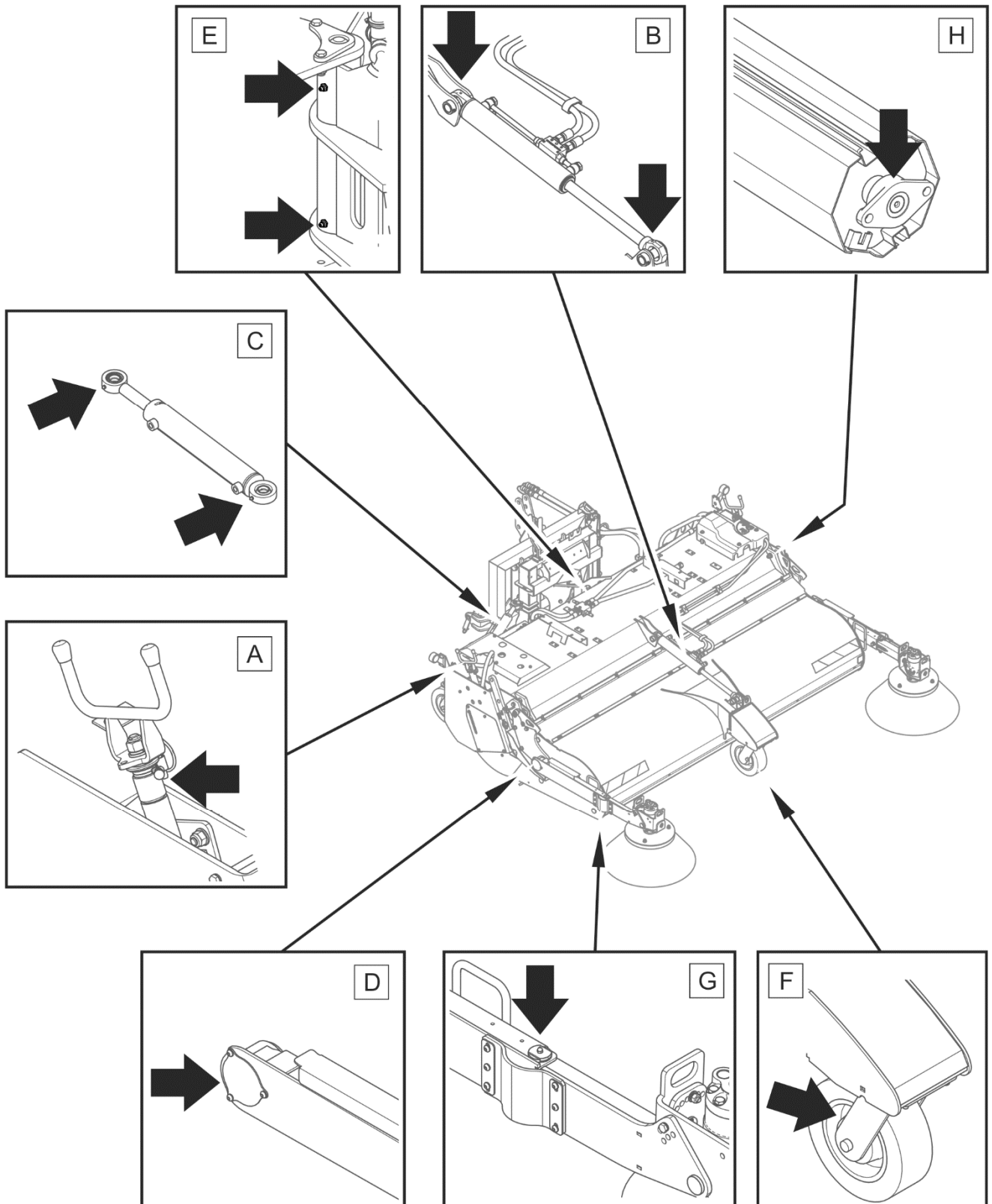


FIGURE 5.17 Lubrication points

Lubrication points are described in Table TABLE 5.5

Machine lubrication should be performed with the aid of a grease gun filled with ŁT-43-PN/C-96134 grease. After lubricating according to instructions, wipe off excess grease.



When using the machine the user is obliged to observe lubrication instructions according to attached schedule. Excess lubrication substance causes depositing additional contaminants in places requiring lubrication, therefore it is essential to keep individual machine elements clean.

5.10 STORAGE

Before storing the machine, disconnect the control panel from the machine and protect it against adverse weather conditions. After finishing work, machine should be thoroughly cleaned and washed with water jet. While washing do not direct a strong water jet at information and warning decals, hydraulic cylinders, electrical equipment. In the event of damage to the lacquer coating clean those places from rust and dirt, degrease and then paint with paint maintaining uniform colour and even thickness of protective coating. Until the time of touch-up painting, the damaged place may be covered with a thin layer of grease or anti-corrosion preparation. It is recommended to keep the machine in a closed or roofed building. If the machine shall not be used for a long period of time, protect it against adverse weather conditions. Lubricate machine according to the instructions provided. In the event of prolonged work stoppage, it is essential to lubricate all elements regardless of the date of the last lubrication. Additionally, before the winter period, apply grease to hitching system pins. If there is a risk that temperatures drop below 0°C, drain water from the sprinkler system and blow the water pump through with compressed air.

5.11 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

Unless other tightening parameters are given, during maintenance repair work apply appropriate torque to tightening nut and bolt connections. Recommended torque values (TABLE 5.6) apply to non-greased steel bolts.

TABLE 5.6 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

THREAD DIAMETER [mm]	5.8	8.8	10.9
	TIGHTENING TORQUE [Nm]		
M6	8	10	15
M8	18	25	36
M10	37	49	72
M12	64	85	125
M14	100	135	200
M16	160	210	310
M20	300	425	610
M24	530	730	1050
M27	820	1150	1650



ATTENTION

Should it be necessary to change individual parts, use only original parts or those indicated by the Manufacturer. Non-adherence to these requirements may put the user and other people's health and life at risk, and also cause damage to the machine.

5.12 TROUBLESHOOTING

TABLE 5.7 TROUBLESHOOTING

FAULT	CAUSE	REMEDY
The roller brush does not rotate	Hydraulic system not connected or incorrectly connected	Check connection
	Wrong oil flow direction in the hydraulic system.	Activate correct hydraulic circuit in the carrying vehicle
	Faulty hydraulic system	Notify service point
	Incorrect flow regulator setting	Set the regulator as recommended
Side brush does not rotate	Hydraulic system not connected or incorrectly connected	Check connection
	Brush drive turned off	Turn on the drive using valve lever
	Faulty hydraulic system	Notify service point
	Incorrect flow regulator setting	Set the regulator as recommended
Side brush rotates too slowly or too quickly	Incorrectly set brush rotation speed regulator	Set brush rotation speed by turning the oil flow regulator knob
Waste tank can not be opened or closed	Waste tank rising valve is closed	Change position of valve lever
	Switch on the control panel is set to controlling the hydraulic steering system	Change position of the switch
	Hydraulic system not connected or incorrectly connected	Check connection
	Wrong oil flow direction in the hydraulic system.	Activate correct hydraulic circuit in the carrying vehicle
	Incorrect flow regulator setting	Set the regulator as recommended
Sprinkler system is not working	Sprinkler system is switched off by means of the switch on the control panel.	Change position of the switch
	Electrical system not connected	Check connection of the electrical system
	No water in the tank	Top up water
	Damaged fuse on power lead	Change fuse
	Sprinkler system clogged	Confirm that the system is not blocked, clean the filters
	Faulty water pump	Notify service point
Sweeper does not collect waste precisely	The roller brush rotation speed is too low	Increase rotation speed
	Pressure applied to the surface by the roller brush is incorrectly set	Adjust according to operator's manual
	Side brush incorrectly set	Adjust according to operator's manual
	Excessive driving speed	Adjust driving speed
	Waste tank is full	Empty the waste tank
	Brushes excessively worn	Replace
Rapid wear of brushes	Brush pressure incorrectly set. Side brush incorrectly set	Adjust according to operator's manual
Material is ejected from under the sweeper	Brush rotational speed too high. Brush incorrectly set. Incorrect setting in the carrying vehicle	Check and adjust according to operator's manual

NOTES

A series of horizontal dotted lines for writing notes.