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OPERATION MANUAL

Snowplough

„Kacper”

PU-1700

PU-2100

5th EDITION
Narew 2004

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I . INTRODUCTION

THE MANUAL describes basic rules of safe operation, maintenance and preservation of the snowplough.

EXACT observation of recommendations of the manual ensures long standing and efficient use of the snowplough.

USE ONLY spare parts manufactured or recommended by the manufacturer . Use of spare parts of unverified quality may cause serious damage of the machine.

Information contained in the manual are valid for the day of manual's edition. Due to later introduced modifications certain values and drawings may differ from the actual state.

„PRONAR” NAREW reserves the right to introduce design modifications without prior notice; information about major design alterations will be supplied to users in the form of annexes to the manual.

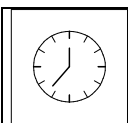
II. GENERAL INFORMATION

Hints and explanations in the manual are accented with graphic symbols.

Graphic symbols



inobservance of information marked with this sign may cause damage of the machine due to improper maintenance, adjustment and operation



this sign means need of periodical maintenance

III. TECHNICAL DATA

Plough type	PU-1700	PU-2100
Type of fastening *	Three-point suspension system	Three-point suspension system
Number of working positions	4	4
Operational width depending on working position	1680mm -1930mm	1920mm -2210mm
Ploughshare working height	900±20 mm	900±20
Scraping slats	Deflectable, metal or rubber	Deflectable, metal or rubber
Control	Hydraulic, with a electromagnetic controller	Hydraulic, with a electromagnetic controller
Weight of ready-to-use machine	250 kg	265 kg
Admissible operational speed	10 km/h	10 km/h

*- both PU-1700 and PU-2100 snowploughs can be fitted with a three-point suspension system Cat. I or Cat. I-II depending on version.

Caution!

Snowploughs „Kacper” marked PU-1700; PU-2100; are adapted for co-operation with agricultural tractors with engines rated at 25 - 50 KM

Type plate.

The type plate is situated on the snowplough frame (Fig. 1).

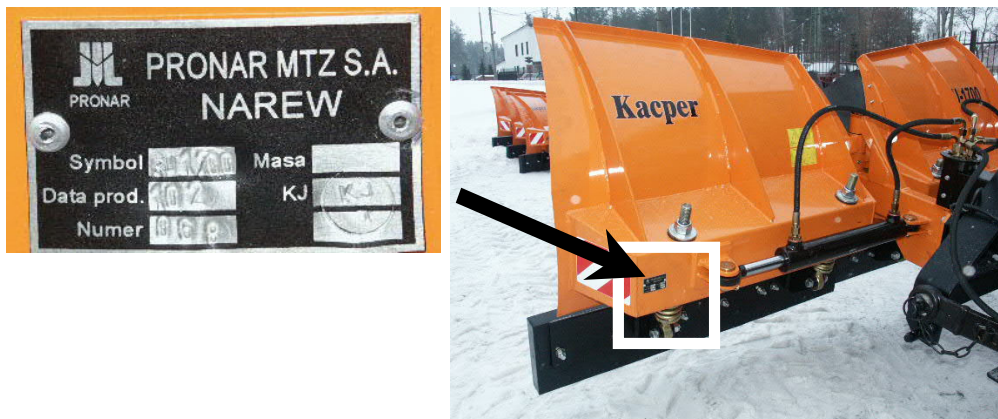


Fig. 1. Placement of the type plate.

Znaki ostrzegawcze występujące na korpusie pluga:

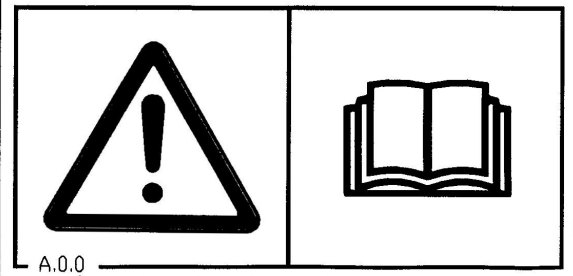
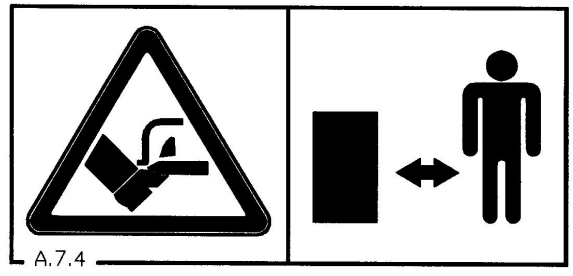
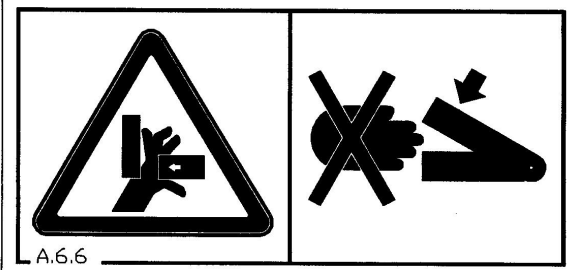
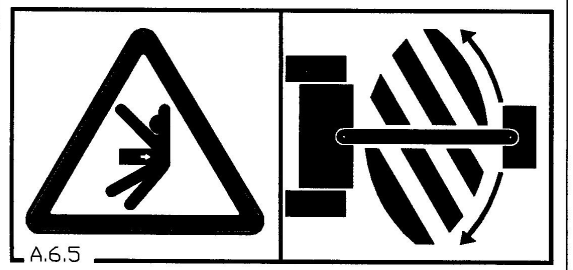

 <p>A.0.0</p>	 <p>A.7.4</p>
<p>Caution! Prior to operation, maintenance or repair read the operation manual.</p>	<p>Caution! Keep safe distance if the engine is on. Danger of foot / leg injury!</p>
 <p>A.6.6</p>	 <p>A.6.5</p>
<p>CAUTION! Do not reach into the area of crushing if some elements can move – danger of hand / fingers injury</p>	<p>Danger of crushing Third person must not stay within zones marked with this sign if the machine is working. If there is a need of performing any works within this zone make sure that the tractor stands still and the machine is disconnected from the energy source.</p>

Fig. 2 Warning signs

IV. DESIGNATION AND STRUCTURE OF THE SNOWPLOUGH.

Designation:

The snowplough is designed for snow removal from roads, squares, parking areas and all other hardened road and pavement surfaces. PRONAR- NAREW takes no responsibility for use inconsistent with recommendations (e.g. levelling, transportation of goods etc.) and for damage resulting from such use – warranty becomes void.

	<p>CAUTION: During operation and transportation of the plough the tractor should be equipped with signalling for emergency vehicles (yellow blinking lamp).</p>
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Snowplough structure: (Fig. 3)

The snowplough consists of a frame (1) fastened with screws to the frame of three-point suspension system (2), which coupled with a tractor. Other main elements are right and left ploughshares (7 i 8) installed on the main pivot (14) of the snowplough. Such construction allows each ploughshare to be set at various angles. Working angle of each ploughshare can be adjusted with two hydraulic cylinders (9 i 10) controlled with an electromagnetic controller; the controller is supplied with an electric cable (11). The hydraulic system is supplied with oil from the tractor via two conduits. (12). During operation the snowplough touches ground with two scraping slats (6), which – when meet an obstacle – deflect thanks to shock absorbing springs (5). During stop the snowplough is supported additionally with a prop (3)

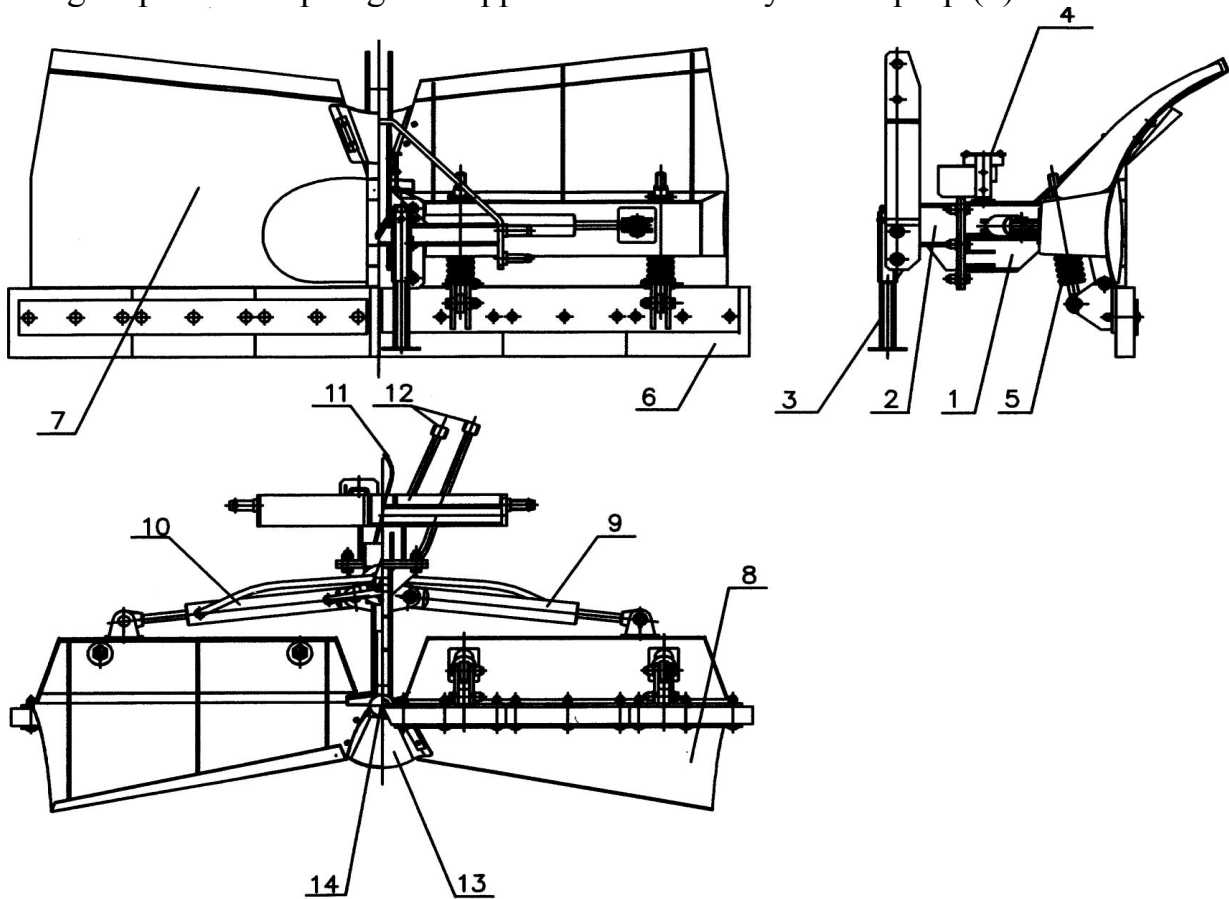


Fig. 3 Snowplough structure.

1-frame; 2-frame of the three-point suspension system; 3-prop; 4-electromagnetic controller; 5-shock absorbing springs; 6-deflectable scrapping slats; 7-right ploughshare; 8-left ploughshare; 9-left hydraulic cylinder; 10-right hydraulic cylinder; 11-electric cable; 12-hydraulic conduits; 13-rubber shield; 14-main pivot.

V. PRINCIPLES OF SAFE OPERATION AND MAINTENANCE

General requirements

Prior to operating the snowplough read the manual thoroughly; brief acquaintance may result in situations endangering operator's health or damage of equipment.

Careful and consequent observation of safety principles and requirements and observation of traffic regulations protects the operator and other road users against all threats; ensures also optimum utilisation of snowplough performance protecting it against failure, damage or destruction.

Principles of safe maintenance

- Prior to operation perform visual inspection of the machine, and especially:
 - condition of screwed connections (fastenings) of main components of the machine,
 - proper coupling with the tractor,
- For coupling with the tractor use only original bolts and original safety devices.
- Adjust the suspension system so that coupled snowplough in its transport position is rigid connected with the tractor. ANY PLAY IN THE SUSPENSION SYSTEM IS INADMISSIBLE.
- Do not install parts or components, which introduce modifications to the snowplough structure without prior agreement of the manufacturer.
- Do not couple the tractor of lower than required load of the rear hitch. This may cause damage / failure of the tractor.
- During longer stops lower the snowplough to the rest position.
- Do not maintain the tractor or perform any operation under the snowplough if it is in upper position.
- Do not wash, adjust or maintain the snowplough if tractor's engine is on.
- Damaged hoses and hydraulic conduits should be replaced immediately with original ones.

Safety principles during transportation

- Observe traffic regulations while driving on public roads.
- Do not left the tractor with the snowplough on slopes, however, if it is necessary first lower the snowplough, switch on the 1st gear and activate the parking brake.

VI. OPERATION

Snowplough operators should first read the operation manual. Pay special attention to proper use of the machine.

6.1. Conditions of coupling with the tractor.

To couple the snowplough with the tractor first consider following points:

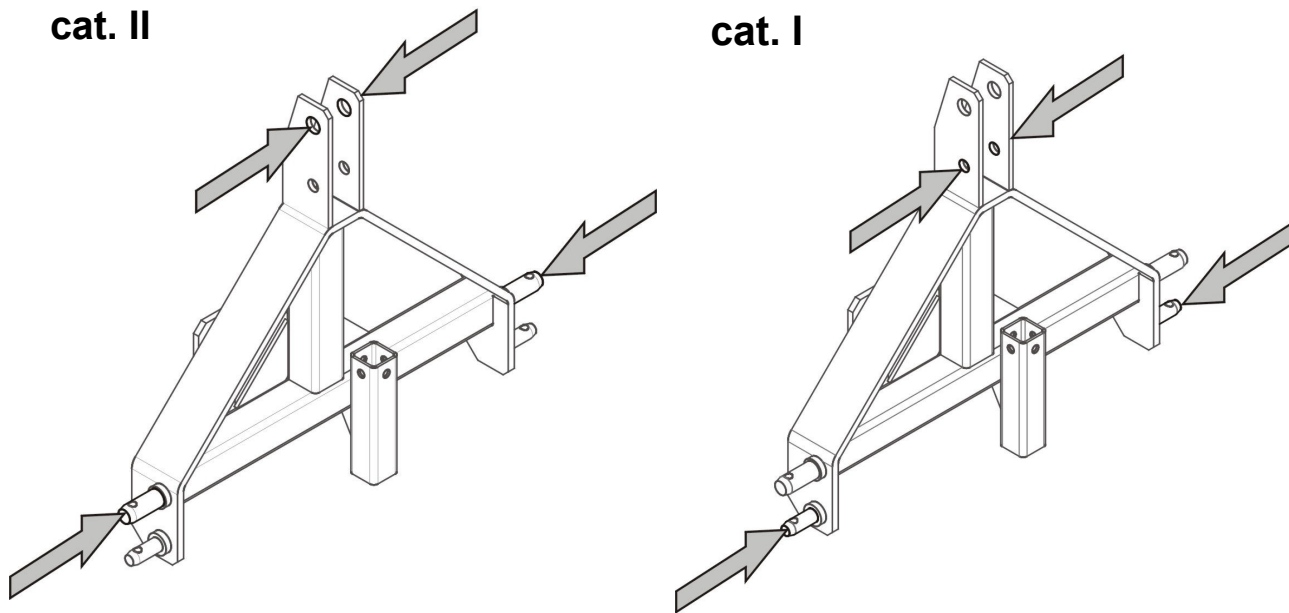
- operation of the snowplough requires bi-directional hydraulic system with reverse circulation and with one pair of quick-release connectors in the front of the tractor.
- Additionally, the tractor should be fitted with a bundle with switch and electric socket in the front of the tractor;
- The tractor should be fitted with a front three-point hitch Cat. I or II (depending on snowplough version)

6.2. Coupling with a tractor (front three-point hitch).

To couple the snowplough with the tractor perform following operations:

- drive with the tractor as close to the snowplough as possible;
- put lower pull rods of the three-point hitch on snowplough pivots and secure with a spring cotter pin;
- connect upper tractor's connector with the upper snowplough coupling point with a bolt and secure with a spring cotter pin;

- having installed lower pull rods and central connector adjust tension of chains limiting side movements of the snowplough with adjustment screws.
- having coupled the snowplough check all screws and protection devices.



Rys 4. Three-point suspension (coupling points).



CAUTION!

For optimum operation conditions adjust horizontal position of the snowplough body with the central connector of the tractor (axis of the main pivot of ploughshares should be perpendicular to the ground), otherwise scraping slats will wear unequally.

6.3. Connection of hydraulic supply.

Connect snowplough hydraulic conduits to tractor's external hydraulic system with two quick-release connectors 1 (Fig. 6). While connecting hydraulic conduits make sure that they are not bent and twisted; secure the conduits against damage.

Additionally connect electric power supply to the electromagnetic controller. For this purpose connect the controller supply bundle to the socket in the front of the tractor **2** (Fig. 6)

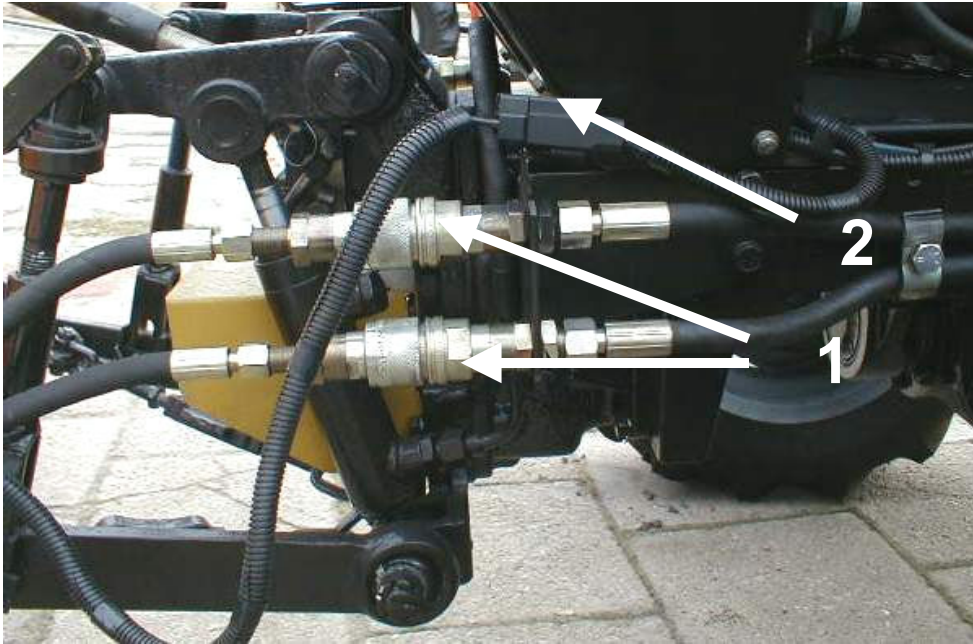


Fig. 6 Hydraulic and electric connections.

1-hydraulic quick-release connectors,
2-electric socket

Having coupled and connected the snowplough check fastening of all protective elements and screwed connections.

6.4. Operation.

If all protective elements and all hydraulic connections are installed properly we can perform the snowplough start-up.

During operation, after coupling to the tractor shift the prop into the guide (upwards), lock with a bolt and secure with a spring cotter pin (Fig. 6).

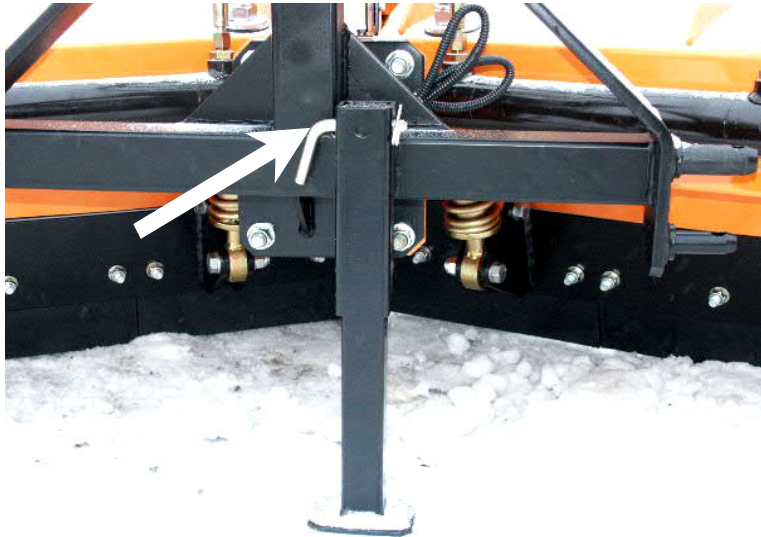
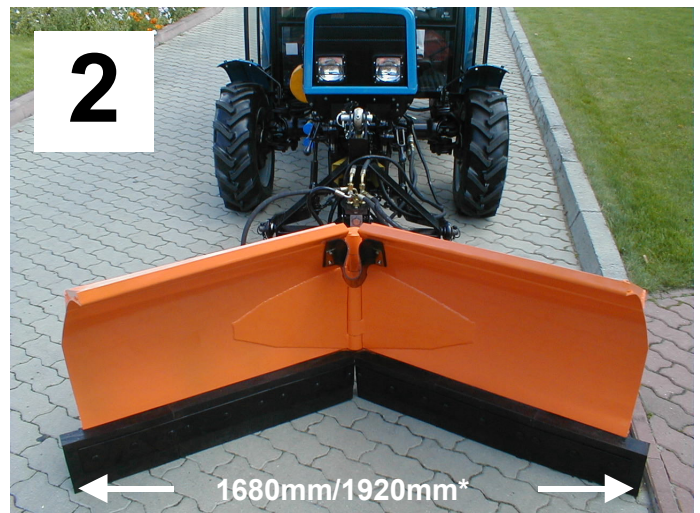


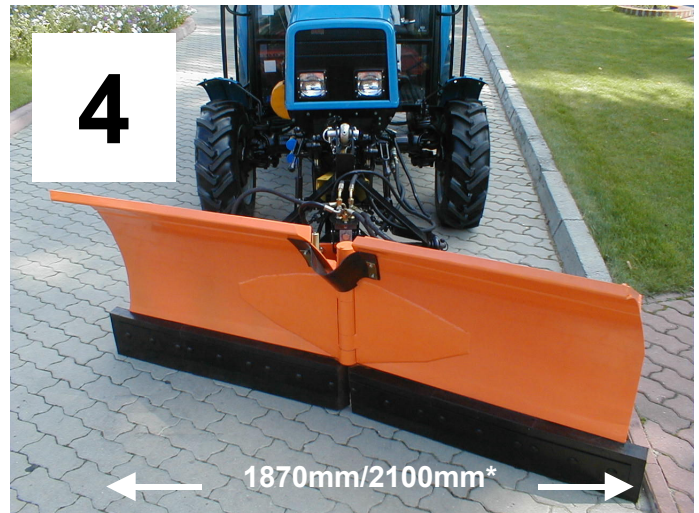
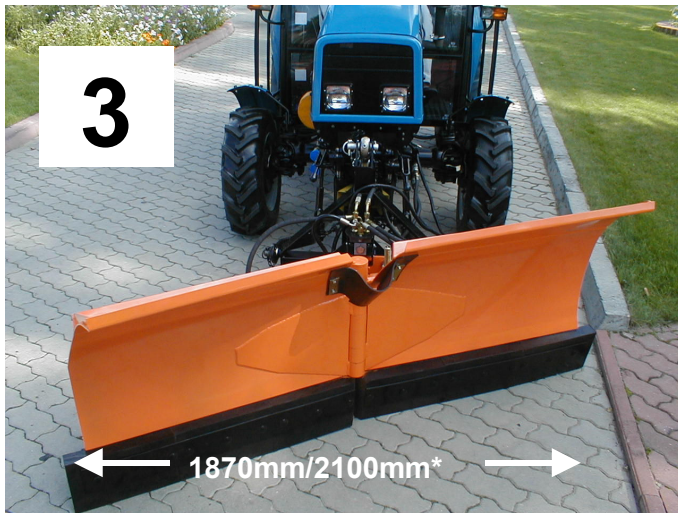
Fig. 7 Snowplough prop.

Operational speed of the snowplough depends on type and volume of scraped material (but not greater than 10 km/h). During operation use the hitch adjustment. Tractor's weight must not load the snowplough, because this may result in snowplough destruction.

6.5 Change of position of ploughshares

The snowplough has four working positions. To change the angle of ploughshares use one lever of the distributor and the electric switch in the tractor.





*- dimensions for the PU-2100 snowplough;

Fig. 8 Positions of ploughshares.

When the electric switch is off, the distributor lever controls simultaneously two hydraulic cylinders of snowplough arms. It is possible then to change position of ploughshares from **1** to **2** (Fig. 8).

When the electric switch is on it is possible to deflect one ploughshare from the position **1** to **3** or to **4** with the distributor lever. Lock selected position **3** or **4** by switching off the switch.

Aside from ploughshare angle possible is also adjustment of inclination of scrapping slats **3** (Fig.9) with screws **1** adjusting tension of shock absorbing springs **2** (Fig. 9)



Fig. 9 Adjustment of inclination of scrapping slats

1-adjustment screw; 2-shock absorbing spring; 3-deflectable scrapping slat.

6.6. Assembly / disassembly of the scrapping slat.

Prior to replacement of the scrapping slat raise the snowplough and support its frame with the prop. Stop the tractor (engine off, parking brake activated). Now we can start to replace the scrapping slat.

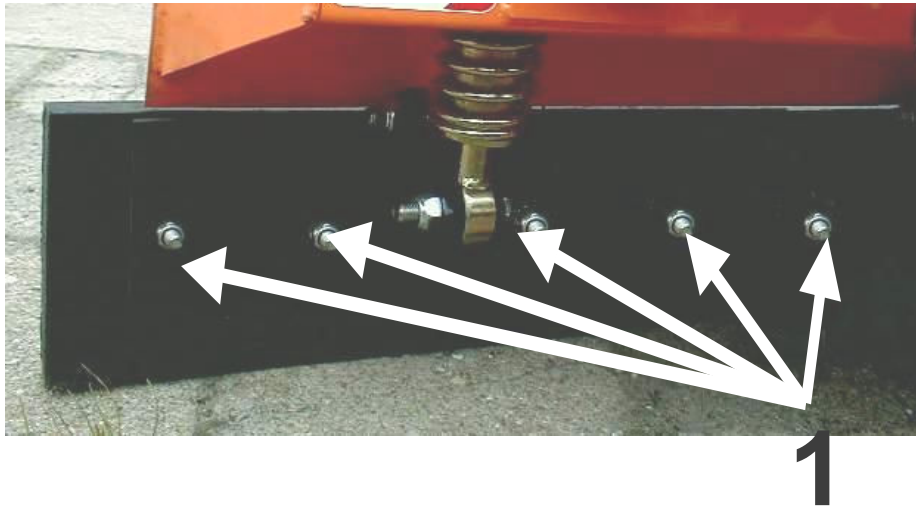



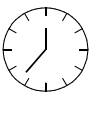
Fig. 10 Scrapping slat
1-fastening screws

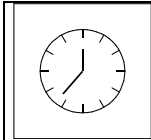
To remove scrapping slats first unscrew the fastening screws **1** (Fig. 10), remove screws from openings, remove the metal slat in the front of the ploughshare and then remove the rubber slat. Installation of scrapping slats should be performed in reverse order.

	<p>CAUTION:</p> <ul style="list-style-type: none"> - during assembly make sure that the scrapping slat is screwed equally
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6.7. Hydraulic system

Prior to each uncoupling of the snowplough from hydraulic supply first reduce the residual pressure in the hydraulic system.

	<p>Schedule of inspections</p> <p>Hydraulic oil level inspection - prior to each start-up</p> <p>Hydraulic oil replacement - once a year</p>
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PRESERVATION AND MAINTENANCE

After the standstill longer than 4 weeks perform thorough inspection of the snowplough.

- cleaning and preservation can be done in your workshop

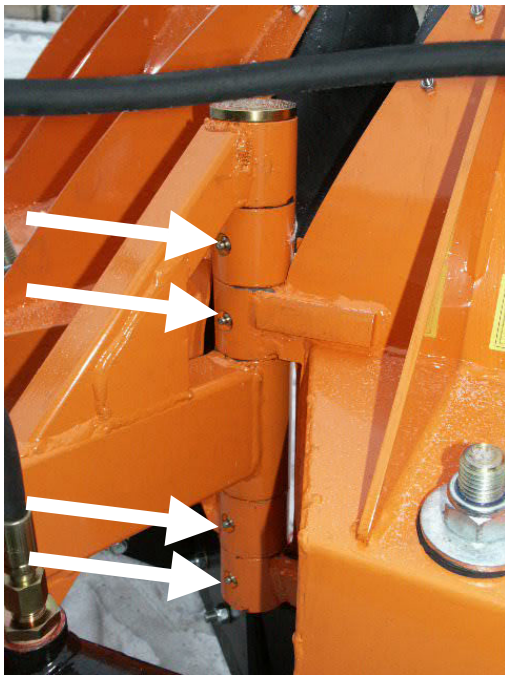
Check the technical condition of the snowplough:

1. Prior to each start-up
2. In regular intervals
3. After modifications and standstills

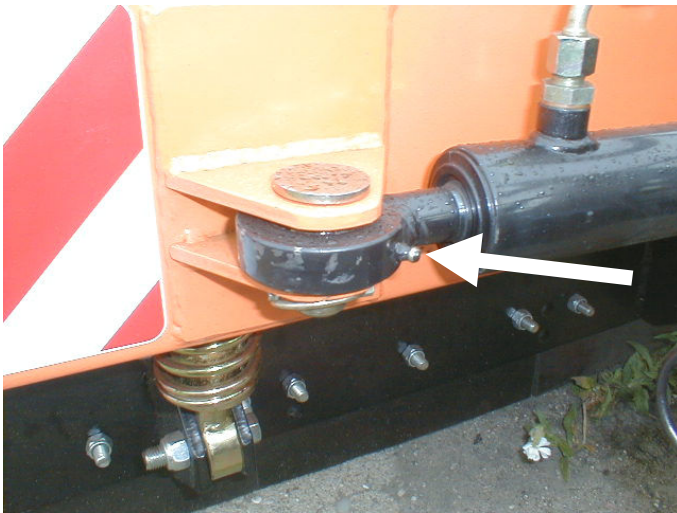
Time of use of hoses should not exceed 6 years.

- during inspection check fastening of all screws; tighten if necessary.
 - check tightness of the hydraulic system;
 - check completeness and proper fastening of all protective elements;
- clean the guides depending on their pollution.

Lubrication points:



Lubrication points (see drawing on the left) are situated on the main pivot, where are axes of rotation of the ploughshares (four points)



Lubrication point of the piston rod eye is situated in the place of fastening of the piston rod to the ploughshare (for each cylinder)



Lubrication point of the cylinder eye is situated in the place of fastening of cylinders to the snowplough frame (for each cylinder)

Fig. 11 Lubrication points

VII. TRANSPORT.

- for transport always raise the snowplough
- secure the snowplough against dropping and tilting;
- observe traffic regulations while driving on public roads.



CAUTION!

During transport set the ploughshares to the position 1 (Fig.8)

VIII. STANDSTILL

During standstill the snowplough should be supported with the prop (Fig. 7).

IX. SPARE PARTS CATALOGUE

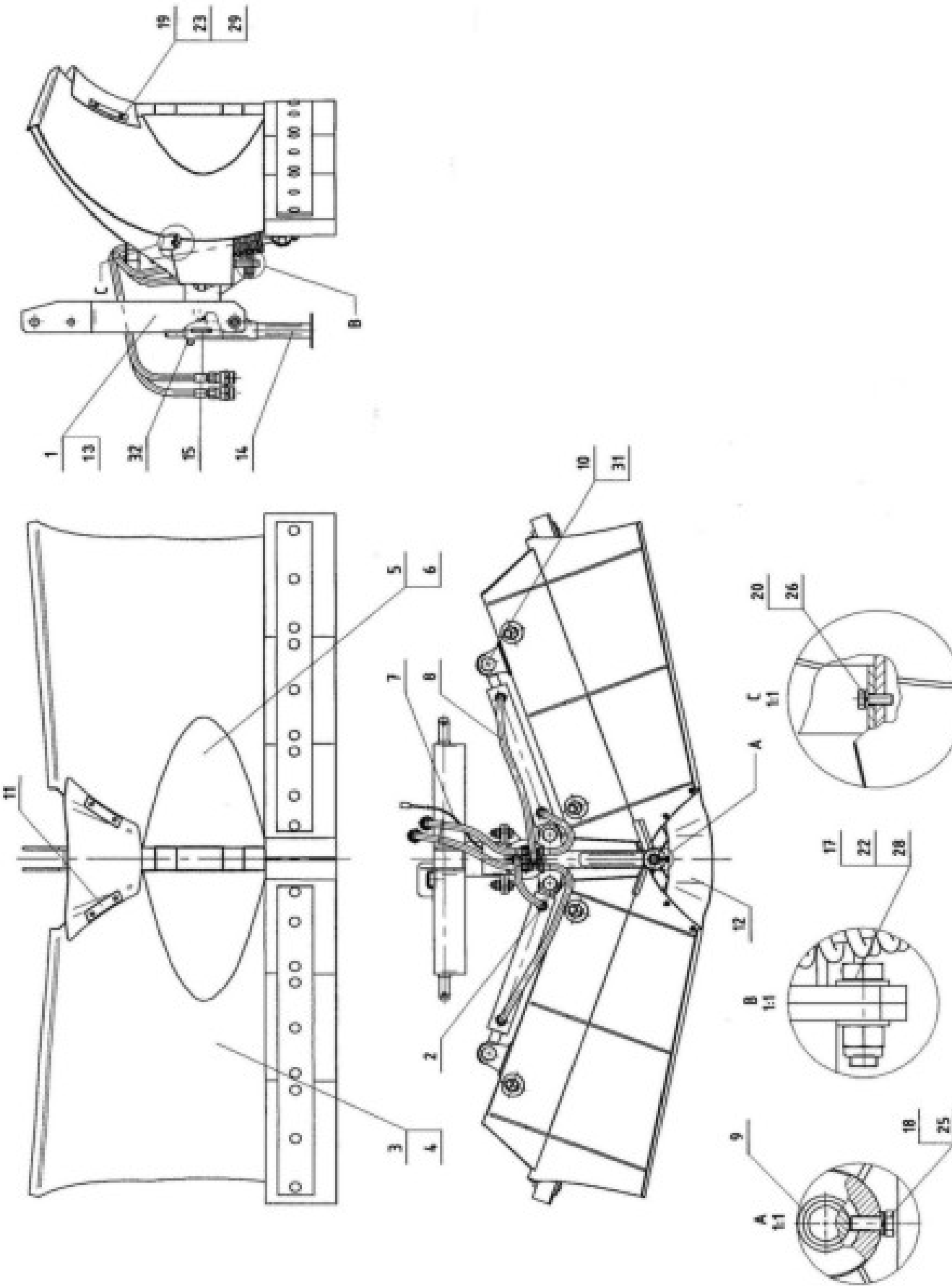


Fig. 12 Snowplough

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
1	Rear hitch	17RPN-01.00.00	1	1	12
2	Arm	17RPN-02.00.00	1	1	12
3	Right ploughshare	17RPN-03.00.00.00P	1	-	12
4	Right ploughshare	17RPN-07.00.00.00P	-	1	12
5	Left ploughshare	17RPN-03.00.00.00L	1	-	12
6	Left ploughshare	17RPN-07.00.00.00L	-	1	12
7	Wiring system, cpl.	17RPN-04.00.00	1	1	12
8	Hydraulic system, cpl.	17RPN-05.00.00	1	1	12
9	Main pivot	17RPN-06.00.00	1	1	12
10	Cylinder bolt	17RPN-00.00.07	4	4	12
11	Plate	17RPN-00.00.08	2	2	12
12	Rubber shield	17RPN-00.00.09	1	1	12
13	Rear hitch *	17RPN-08.00.00	1*	1*	12
14	Foot	12RPN-08.00.00	1	1	12
15	Pin	12RPN-00.00.04	1	1	12
17	Screw M16x50-8,8-B-Fe/Zn5	PN-85/M-82105	6	6	12
18	Screw M8x20-8,8-B-Fe/Zn5	PN-85/M-82105	1	1	12
19	Screw M6x25-8,8-B-Fe/Zn5	PN-85/M-82105	1	1	12
20	Screw M6x16-8,8-B-Fe/Zn5	PN-85/M-82105	2	2	12
22	Self-locking nut M16-8-B-Fe/Zn5	PN-85/M-82175	6	6	12
23	Self-locking nut M6-8-B-Fe/Zn5	PN-85/M-82175	4	4	12
25	Spring washer 8,2-Fe/Zn9	PN-77/M-82008	1	1	12
26	Spring washer 6,1-Fe/Zn9	PN-77/M-82008	2	2	12
28	Washer 17-Fe/Zn9	PN-78M-82005	12	12	12
29	Washer 6,4-Fe/Zn9	PN-78M-82005	4	4	12
31	Pin 6-Fe/Zn5	PN-ISO 7072	4	4	12
32	Spring cotter pin 3x70-Fe/Zn5	PN-ISO 7073	1	1	12

*- both PU-1700 and PU-2100 snowploughs can be fitted with a three-point suspension system Cat. I or Cat. I-II depending on version

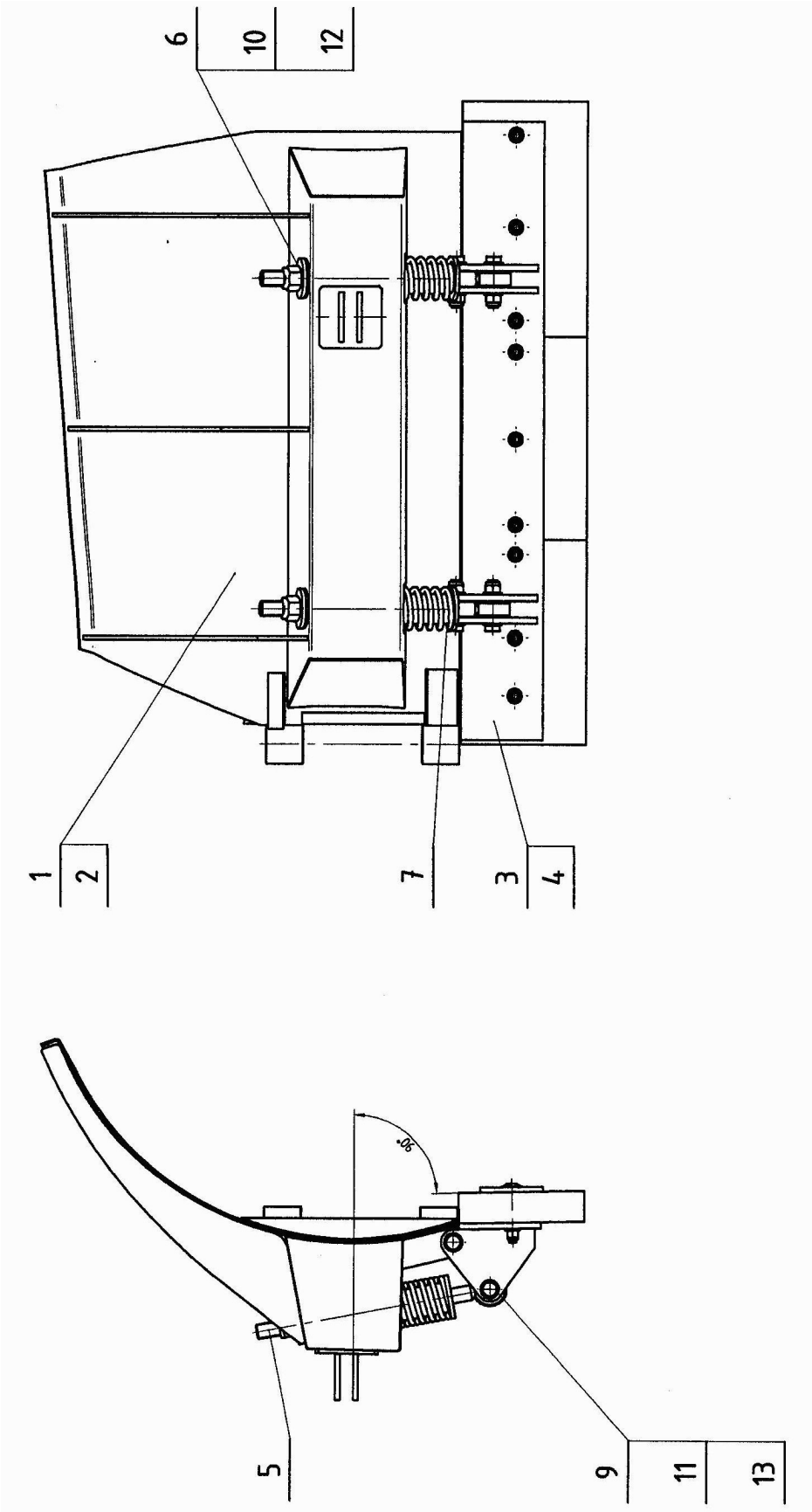


Fig. 13 Right ploughshare

Right ploughshare (Fig. 13)

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
1	Right mouldboard	17RPN-03.01.00.00P	1	-	13
2	Right mouldboard	17RPN-07.01.00.00P	-	1	13
3	Lower slat, right, cpl.	17RPN-03.02.00.00P	1	-	13
4	Lower slat, right, cpl.	17RPN-07.02.00.00P	-	1	13
5	Screw cpl.	17RPN-03.03.00.00	2	2	13
6	Rubber washer	17RPN-03.00.00.04	2	2	13
7	Spring	17RPN-03.00.00.05	2	2	13
9	Screw M16x70-5.8-B-Fe/Zn5	PN-85/M-82101	4	4	13
10	Self-locking nut M24-8-B-Fe/Zn5	PN-85/M-82175	2	2	13
11	Self-locking nut M16-8-B-Fe/Zn5	PN-85/M-82101	4	4	13
12	Washer 25-Fe/Zn5	PN-59/M-82030	2	2	13
13	Washer 17-Fe/Zn5	PN-78/M82005	8	8	13

Left ploughshare (Fig. 14)

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
	Left ploughshare	17RPN-03.00.00.00L	1	-	14
	Left ploughshare	17RPN-07.00.00.00L	-	1	14
1	Left mouldboard	17RPN-03.01.00.00L	1	-	14
2	Left mouldboard	17RPN-07.01.00.00L	-	1	14
3	Lower slat, left, cpl.	17RPN-03.02.00.00L	1	-	14
4	Lower slat, left, cpl.	17RPN-07.02.00.00L	-	1	14
5	Screw cpl.	17RPN-03.03.00.00	2	2	14
6	Rubber washer	17RPN-03.00.00.04	2	2	14
7	Spring	17RPN-03.00.00.05	2	2	14
9	Screw M16x70-5,8-B-Fe/Zn5	PN-85/M-82101	4	4	14
10	Self-locking nut M24-8-B-Fe/Zn5	PN-85/M-82175	2	2	14
11	Self-locking nut M16-8-B-Fe/Zn5	PN-85/M-82101	4	4	14
12	Washer 25-Fe/Zn5	PN-59/M-882030	2	2	14
13	Washer 17-Fe/Zn5	PN-78/M-82005	8	8	14

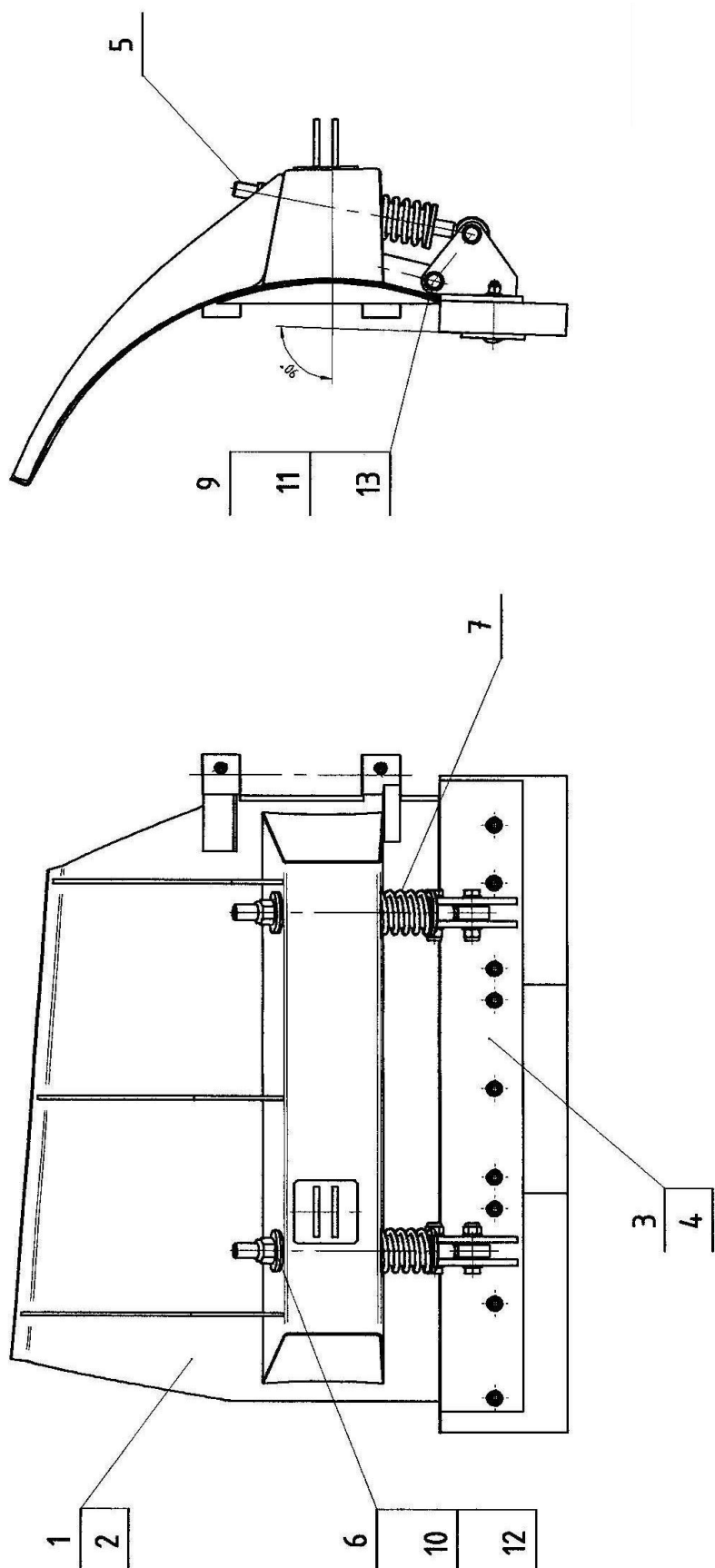


Fig. 14 Left ploughshare

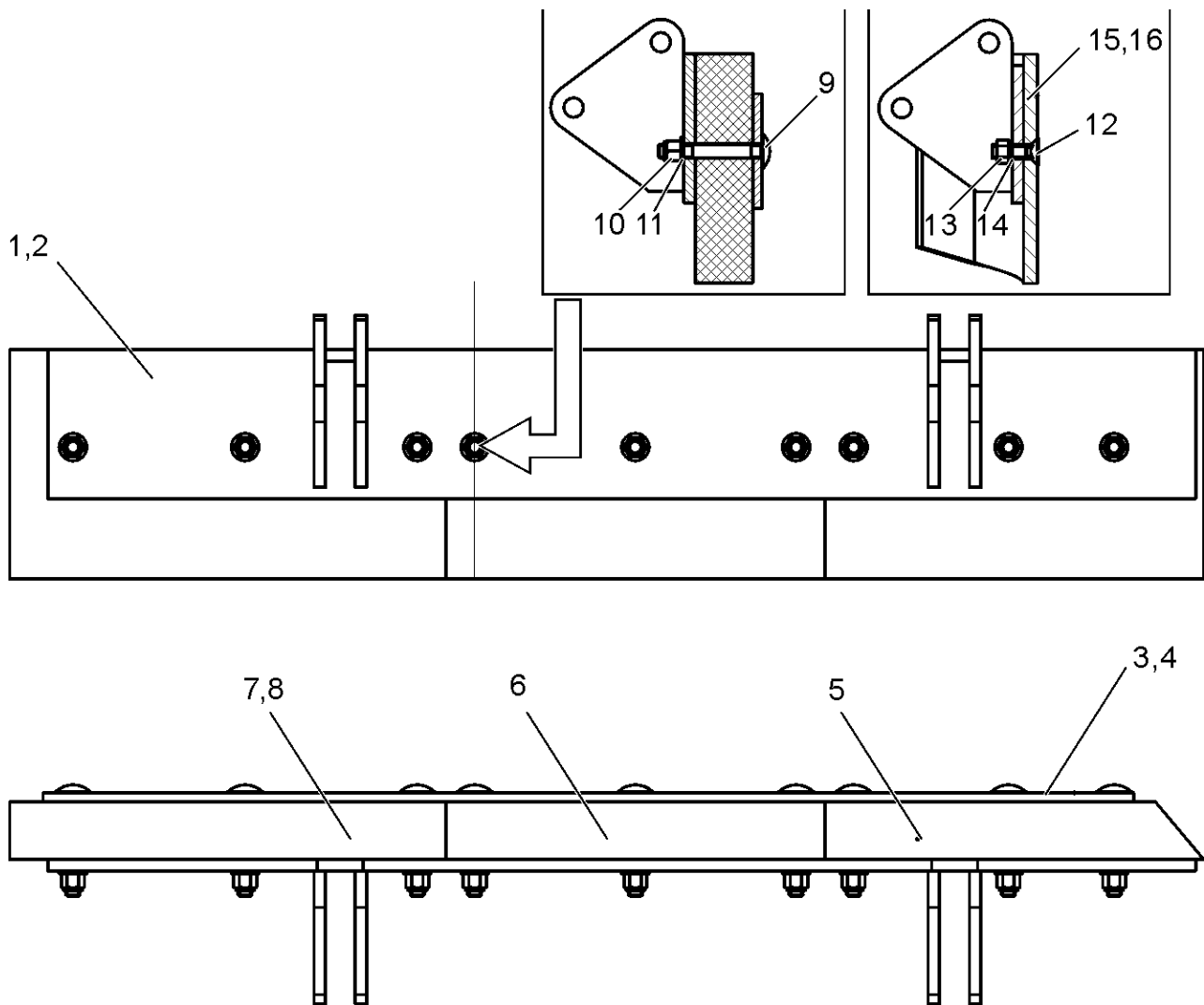


Fig. 15 Scrapping slat, left, complete

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
1	Scrapping slat, left, complete	17RPN-03.02.00.00L	1	-	15
2	Scrapping slat, left, complete	17RPN-07.02.00.00L	-	1	15
3	Pressure slat	17RPN-03.02.00.01	1	-	15
4	Pressure slat	17RPN-07.02.00.01	-	1	15
5	Rubber I left	17RPN-03.02.00.02L	1	1	15
6	Rubber II	17RPN-03.02.00.03	1	1	15
7	Rubber III	17RPN-03.02.00.04	1	-	15
8	Rubber III	17RPN-07.02.00.04	-	1	15
9	Screw P M12x90-4,8-Fe/Zn5	PN-87/M-82406	9	10	15
10	Self-locking nut M12-8-B-Fe/Zn5	PN-85/M-82175	9	10	15
11	Washer 12-100HV-Fe//Zn5		9	10	15
12	Screw Z M12x40-4,8-ox*		4	4	15
13	Nut M12-5-Fe//Zn5*		4	4	15
14	Washer Z12,2 Fe//Zn5*		4	4	15
15	Scrapping slat (steel)*	17RPN-03.02.00.05L	1	-	15
16	Scrapping slat (steel)*	17RPN-07.02.00.05L	-	1	15

*- option

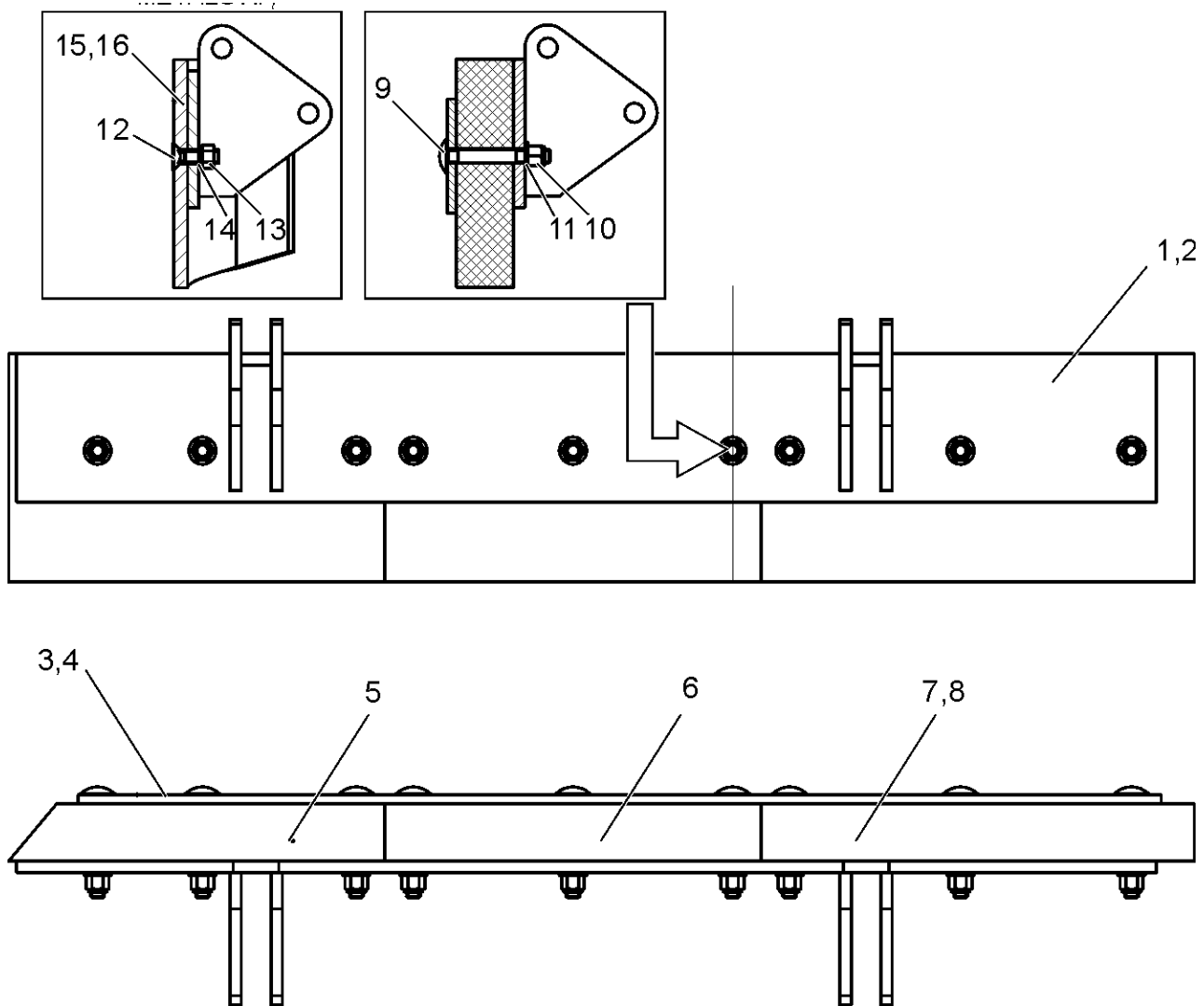


Fig. 16 Scrapping slat, left, complete

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
1	Scrapping slat, left, complete	17RPN-03.02.00.00L	1	-	16
2	Scrapping slat, left, complete	17RPN-07.02.00.00L	-	1	16
3	Pressure slat	17RPN-03.02.00.01	1	-	16
4	Pressure slat	17RPN-07.02.00.01	-	1	16
5	Rubber I left	17RPN-03.02.00.02L	1	1	16
6	Rubber II	17RPN-03.02.00.03	1	1	16
7	Rubber III	17RPN-03.02.00.04	1	-	16
8	Rubber III	17RPN-07.02.00.04	-	1	16
9	Screw P M12x90-4,8-Fe/Zn5	PN-87/M-82406	9	10	16
10	Self-locking nut M12-8-B-Fe/Zn5	PN-85/M-82175	9	10	16
11	Washer 12-100HV-Fe//Zn5		9	10	16
12	Screw Z M12x40-4,8-ox*		4	4	16
13	Nut M12-5-Fe//Zn5*		4	4	16
14	Washer Z12,2 Fe//Zn5*		4	4	16
15	Scrapping slat (steel)*	17RPN-03.02.00.05L	1	-	16
16	Scrapping slat (steel)*	17RPN-07.02.00.05L	-	1	16

*- option

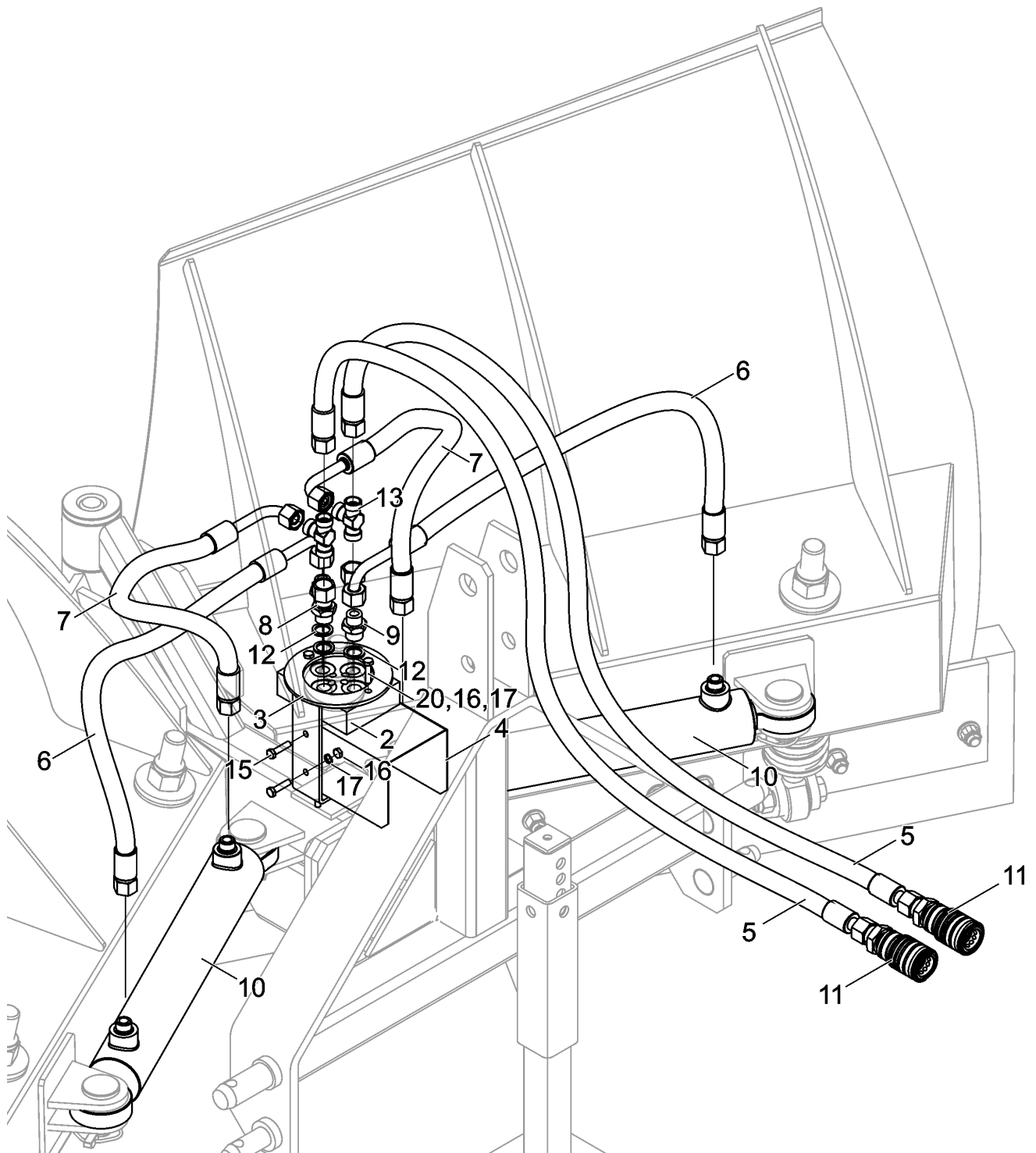


Fig. 17 Hydraulic system (scheme)

No.	Part	Catalogue or standard No.	Quantity		Dwg No.
			PU-1700	PU-2100	
1	Slide distributor - el.	4WE6CJ5/G12NZ4	1	1	17
2	Plate	G342/02	1	1	17
3	Bracket	17RPN-05.01.00	1	1	17
4	Shield	17RPN-05.00.01	1	1	17
5	Conduit	17RPN-05.02.00	2	2	17
6	Conduit	17RPN-05.03.00	2	2	17
7	Conduit	17RPN-05.04.00	2	2	17
8	Connector	6RPN-04.35.02	2	2	17
9	Connector body	6RPN-04.35.12	2	2	17
10	Hydraulic cylinder	33RPN-04.04.00.00	2	2	17
11	Quick-release connector	ZSR32-WD1	2	2	17
12	Sealing ring, round	13x2	4	4	17
13	T-connector 16-8	PN-66/M-73147	2	2	17
14	Screw M5x50-10.9 Fe/Zn6c	PN-87/M82302	4	4	17
15	Screw M6x16-5.8-B Fe/Zn6c	PN-85/M-82105	4	4	17
16	Nut M6-5-B Fe/Zn6c	PN-85/M-82144	6	6	17
17	Spring washer 6,1 Fe/Zn6c	PN-85/M-82008	6	6	17
20	Screw M6x25 Fe/Zn6c	PN-85/M-82105	2	2	17

