

# SERVICE MANUAL

**S24 (9+9) SHUTTLE XL**  
**Hydraulic**

# **SERVICE MANUAL**

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## **MITA HYDRAULICS GARDENTRAC SERIES 20,24,26**

**INTERNATIONAL TRACTORS USA CORPORATION**

2332 MT. ZION ROAD

GREEN WOOD, AR

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# HYDRAULIC SYSTEM

## H 1.0 INTRODUCTION

A system where fluid is used as media to transfer power is called Hydraulic System.

The reason for using hydraulic system for power transfer over mechanical system is due to following merits:

- ÿ Fluid can be routed around any corner with fewer problems in comparison to mechanical linkage system.
- ÿ Power can be engaged with ease using control valve.
- ÿ Because of self lubrication wear & tear is less and system is very economical to operate.
- ÿ In tractors depending upon the drive to hydraulic pump and its location system can be live as well as non-live. When pump is getting drive from transmission the system is called non-live. "LIVE" hydraulic system is there in models 20,24 & 26.

Hydraulic system is constant volume hydraulic system in models 20,24 & 26. The discharge oil from hydraulic pump is always constant and continuous. The pressure of system is changed by changing the hindrance, which is created in the system with the help of different valves.

## H 2.0 SPECIFICATIONS

PARAMETER	DETAILS
Oil capacity	18 Litres
Oil grade	ELF-2412 (SAE-80W)
Hydraulic Pump	Gear type
Flow at rated engine speed	13.3 L/min (at 90% efficiency of pump)
Filters	One magnetic suction strainer in suction line
Type of linkage lock for transport	Response control knob in closed position as transport lock
Control levers	a) Position control lever
	b) Response control knob
Oil change period	After every 1000 hours of operation
Maximum lifting capacity	<b>Model 20:</b> 500 Kg, <b>model 24/26:</b> 600 Kg

### Technical Features:

- ÿ Functioning at controlled position
- ÿ Three point linkage fixed
- ÿ Possibility to regulate the lowering speed of implement
- ÿ Manual hydraulic stop against accidental lowering of
- ÿ Implement during road transport
- ÿ Limit stop of lifting arms in position of maximum height
- ÿ Determined by position lever
- ÿ Sector control with lever
- ÿ Functions with oil of transmission
- ÿ Oil filter not built-in
- ÿ Required degree of filtering: 20÷25µm
- ÿ Oil temperature: 80°C

## HYDRAULIC SYSTEM

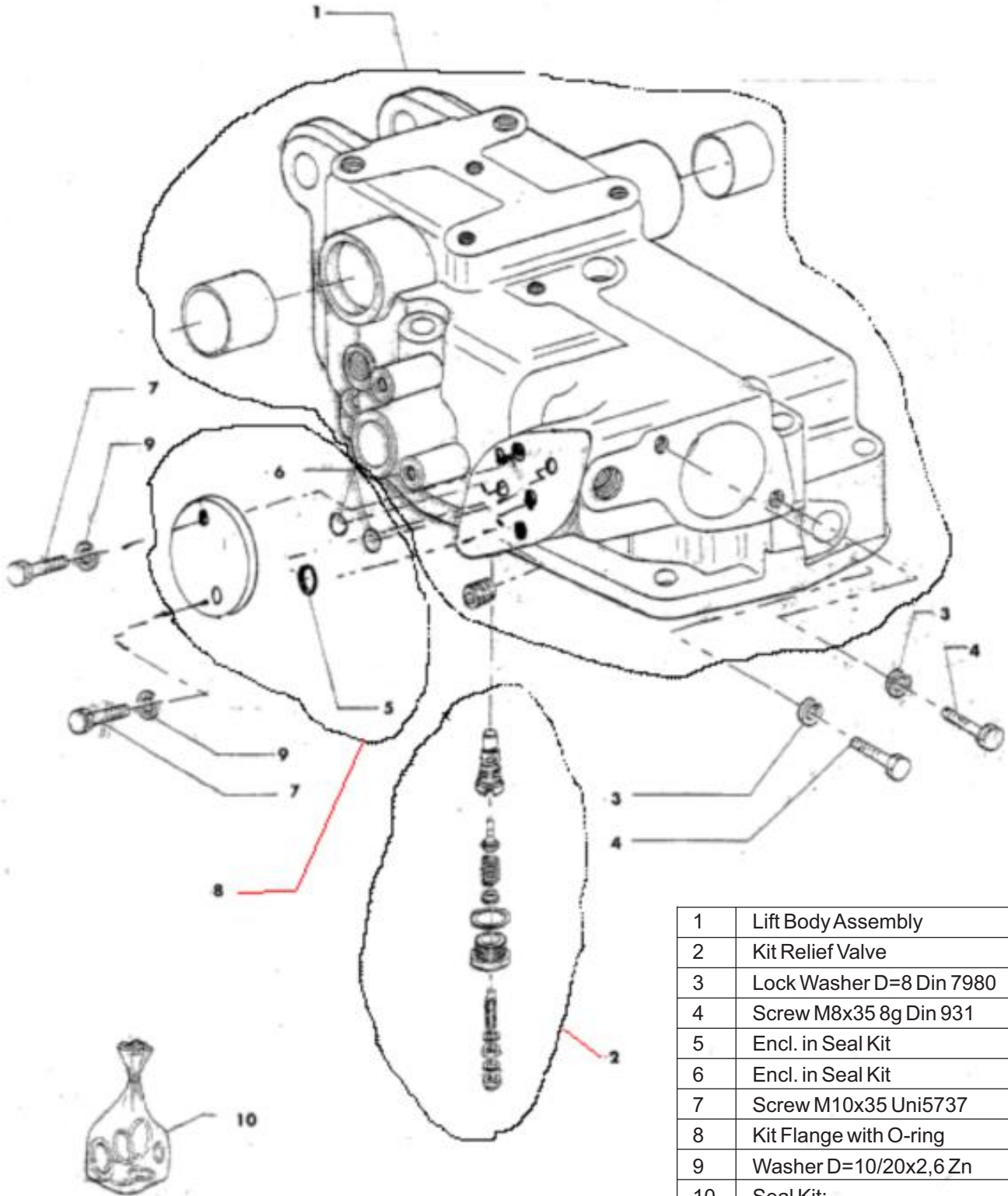
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### Dimensional Features

- ÿ Piston diameter: 65mm
- ÿ Working stroke: 92mm
- ÿ Piston displacement: 305 cm<sup>3</sup>
- ÿ Angular excursion of lifting arms in controlled position: 75°
- ÿ Angular excursion of lifting arms in internal mechanical limit stops: 78°
- ÿ Excursion of control lever 42°
- ÿ The position relief valve is external of the rockshaft
- ÿ Calibration of relief valve 170 ±5bar
- ÿ Calibration of cylinder safety valve 205 ±5bar

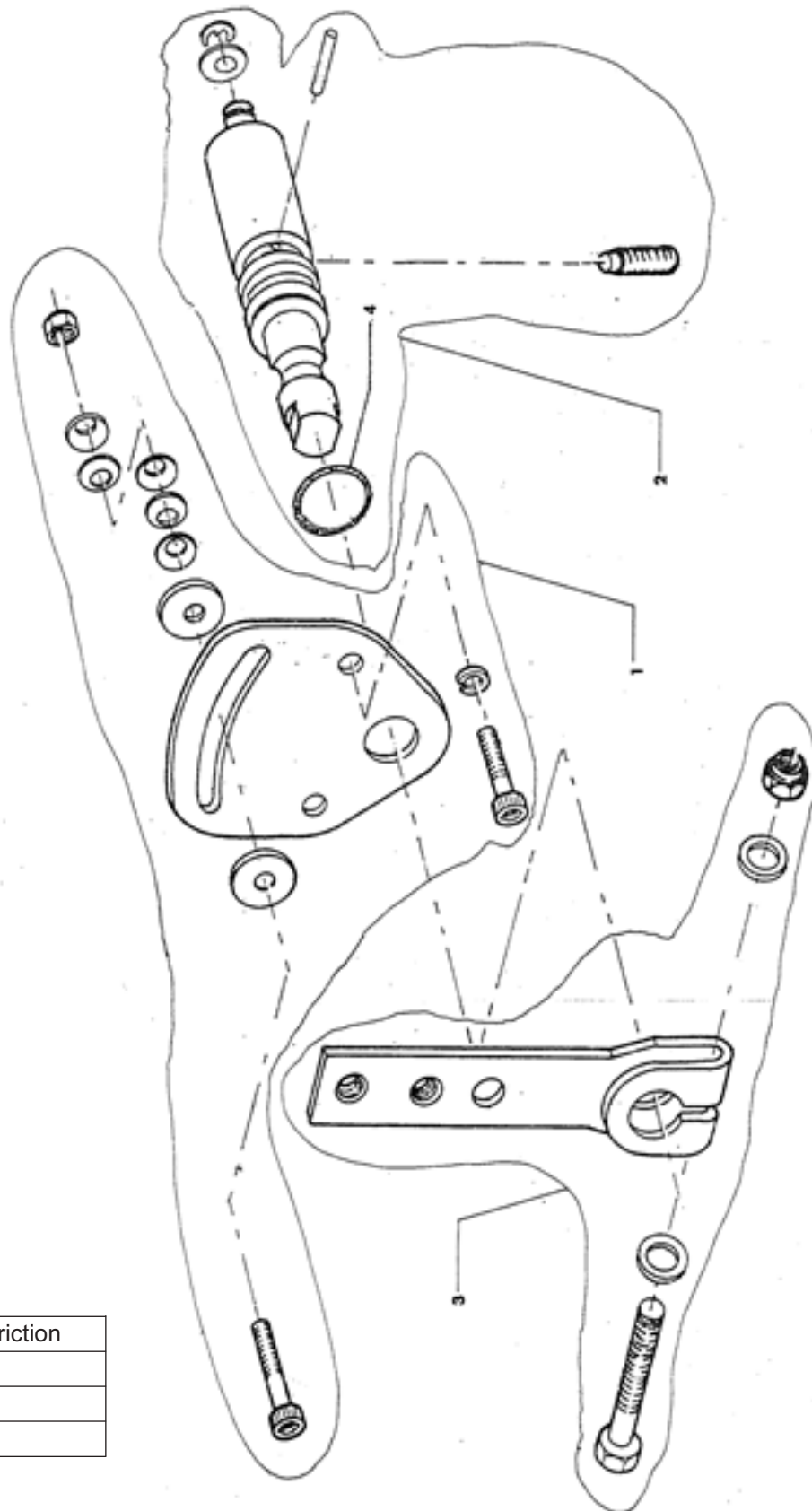
# HYDRAULIC SYSTEM

## H 3.0 DETAILED VIEW OF HYDRAULIC SYSTEM



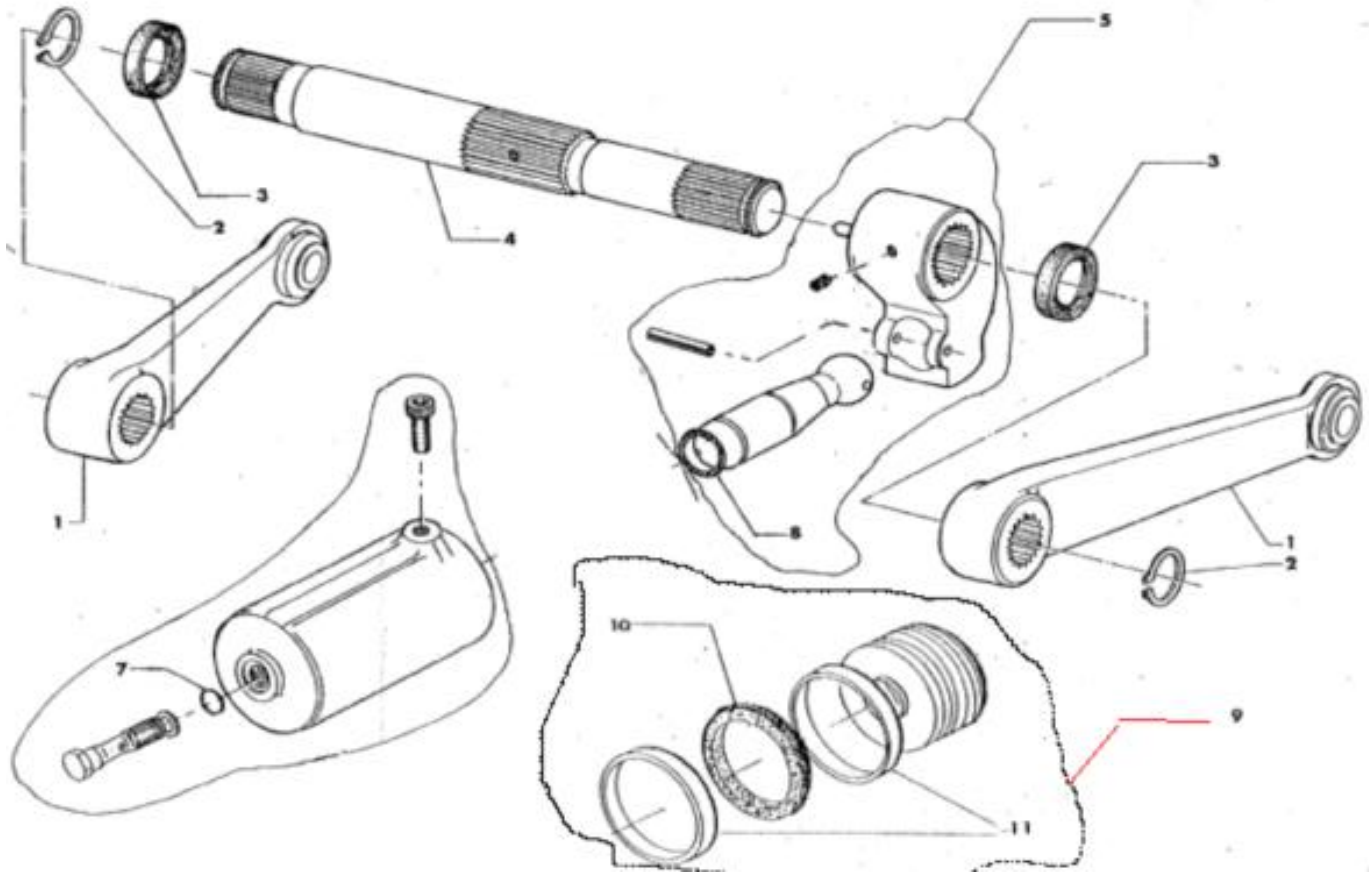
1	Lift Body Assembly
2	Kit Relief Valve
3	Lock Washer D=8 Din 7980
4	Screw M8x35 8g Din 931
5	Encl. in Seal Kit
6	Encl. in Seal Kit
7	Screw M10x35 Uni5737
8	Kit Flange with O-ring
9	Washer D=10/20x2,6 Zn
10	Seal Kit:
	Tab. 1 - Pos. 5 - 6
	Tab. 2 - Pos. 3 - 7 - 8 - 10 - 11
	Tab. 4 - Pos. 4

# HYDRAULIC SYSTEM



1	Kit Quadrant With Friction
2	Kit Camshaft
3	Kit Position Lever
4	Encl. in Seal Kit

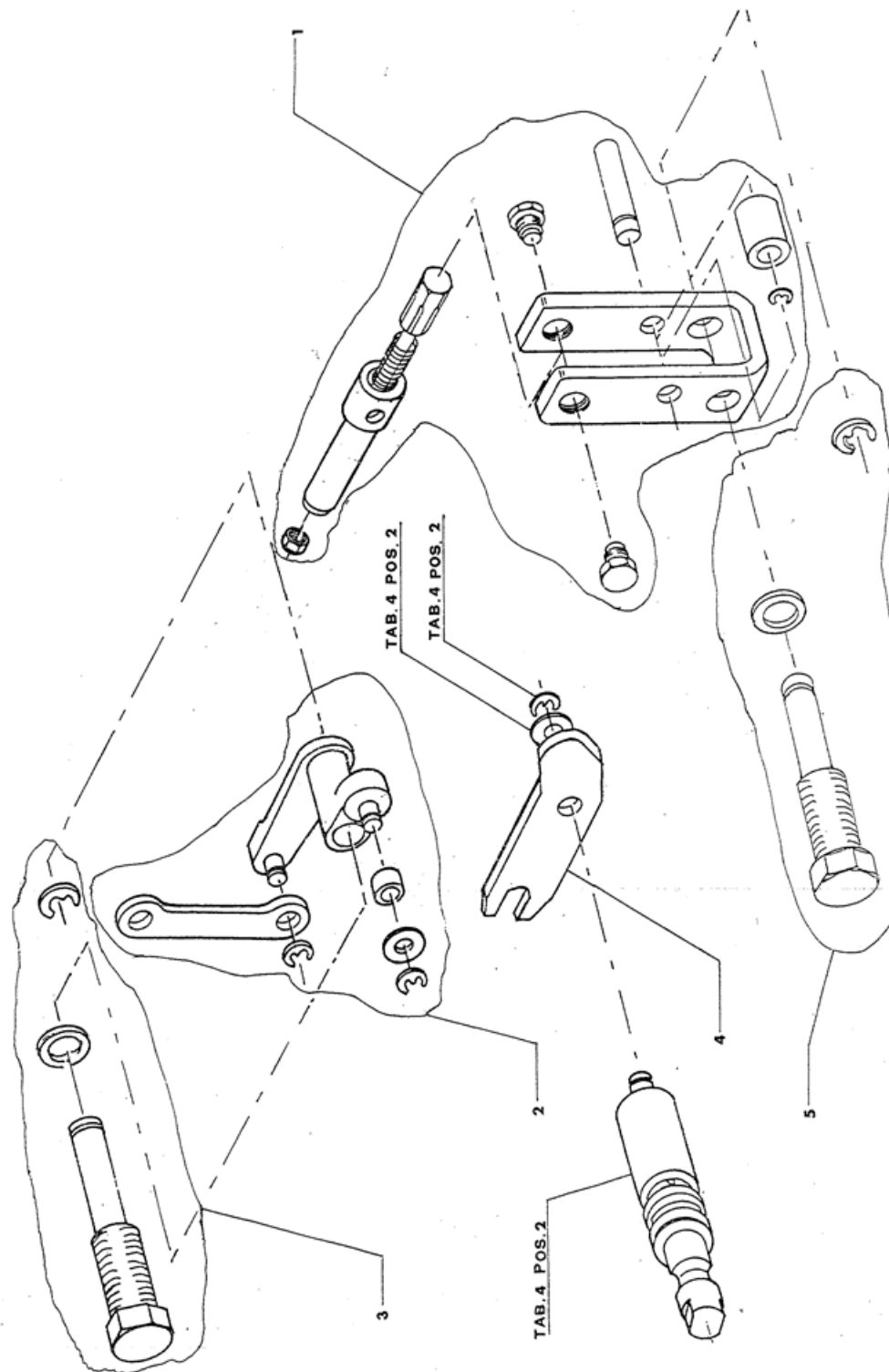
# HYDRAULIC SYSTEM



1	Arm
2	Seeger E34 Din 471
3	Encl. in Seal Kit
4	Shaft
5	Kit Crank
6	Kit Cylinder
7	Encl. in Seal Kit
8	Encl. in Seal Kit
9	Kit Piston
10	Encl. in Seal Kit
11	Encl. in Seal Kit



# HYDRAULIC SYSTEM



1	Kit Lever
2	Kit Compensator
3	Kit Pin
4	Lever
5	Kit Pin

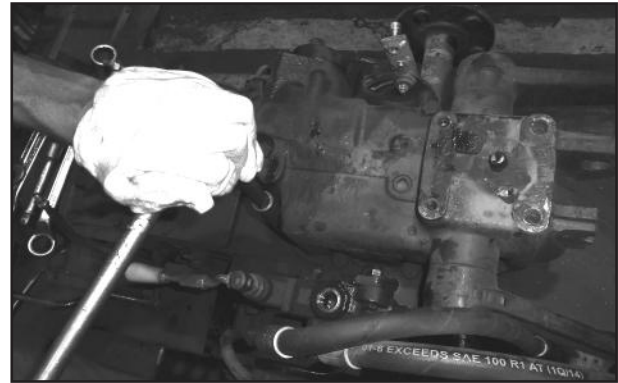
## HYDRAULIC SYSTEM

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### H 4.0 DISMANTLING PROCEDURE FOR HYDRAULIC LIFT

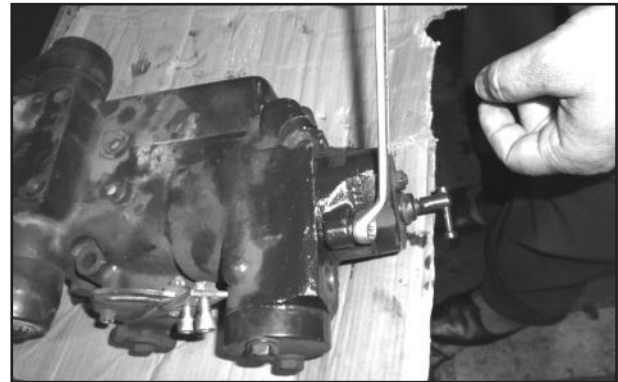
#### Step - 1: Removal of Hydraulic Lift from Transmission Housing

- ÿ First of all, remove lift body assembly from transmission housing by removal of hex bolts (9 nos).



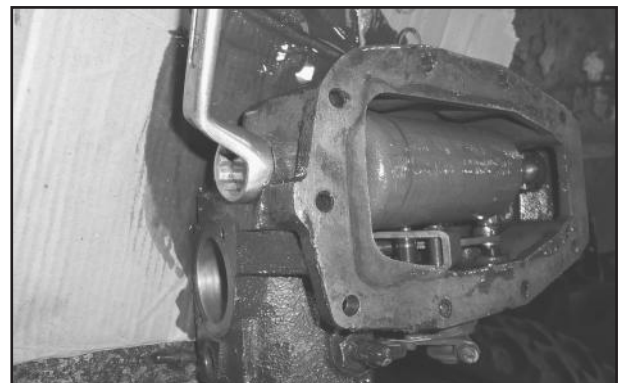
#### Step - 2: Removal of Control Valve Assembly

- ÿ Unscrew hex bolts of control valve body and remove the control valve assembly.



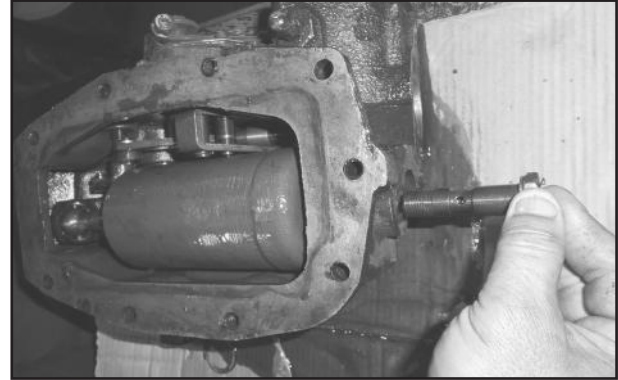
#### Step - 3: Removal of Hydraulic Cylinder

- ÿ Unscrew banjo bolt of hydraulic cylinder.

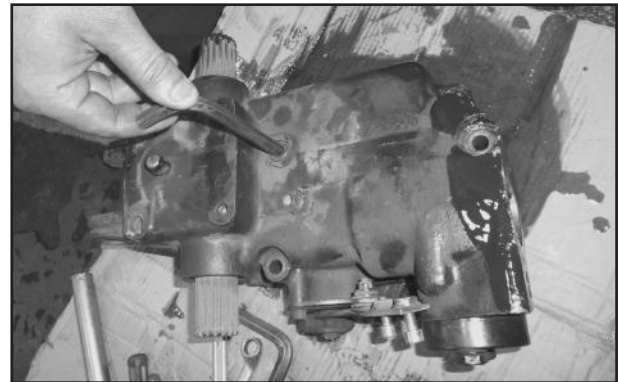


## HYDRAULIC SYSTEM

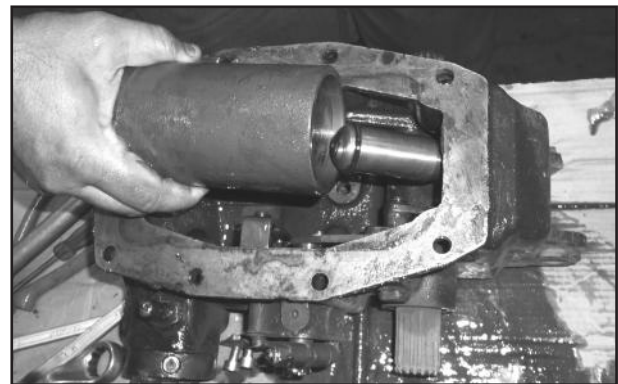
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- ÿ Unscrew allen screw from lift body for removal of hydraulic cylinder.



- ÿ Remove hydraulic cylinder from lift body.



### Step -4: Removal of Rock Shaft

- ÿ Unlock circlip from both ends of Rock Shaft as shown in figure.



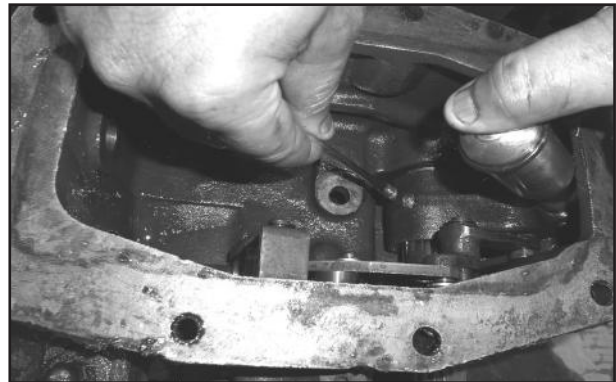
## HYDRAULIC SYSTEM

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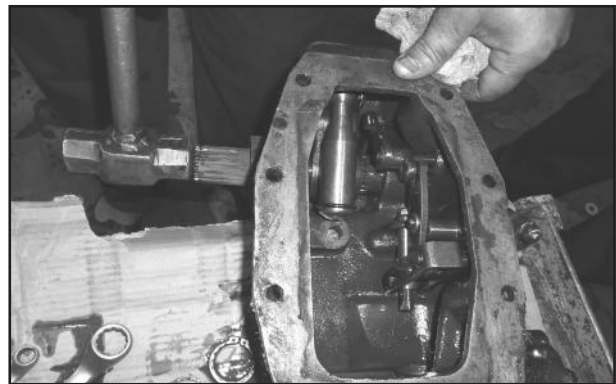
- ÿ Remove lift arms by using hammer as shown in figure.



- ÿ Remove screw plug from ram arm for removal of Rock Shaft as shown in figure.



- ÿ Remove the Rock Shaft by using hammer as shown in figure.

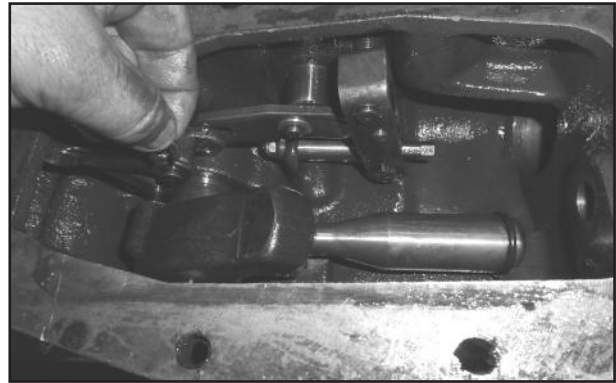


## HYDRAULIC SYSTEM

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### Step - 5: Removal of Lever Assembly

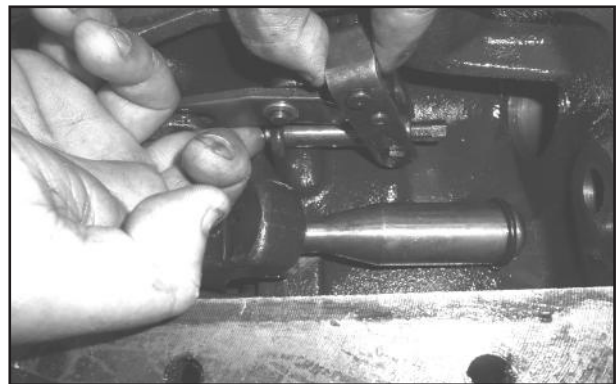
ÿ Remove lock pin (1) as shown in figure.



ÿ Remove lock pin (2) as shown in figure.

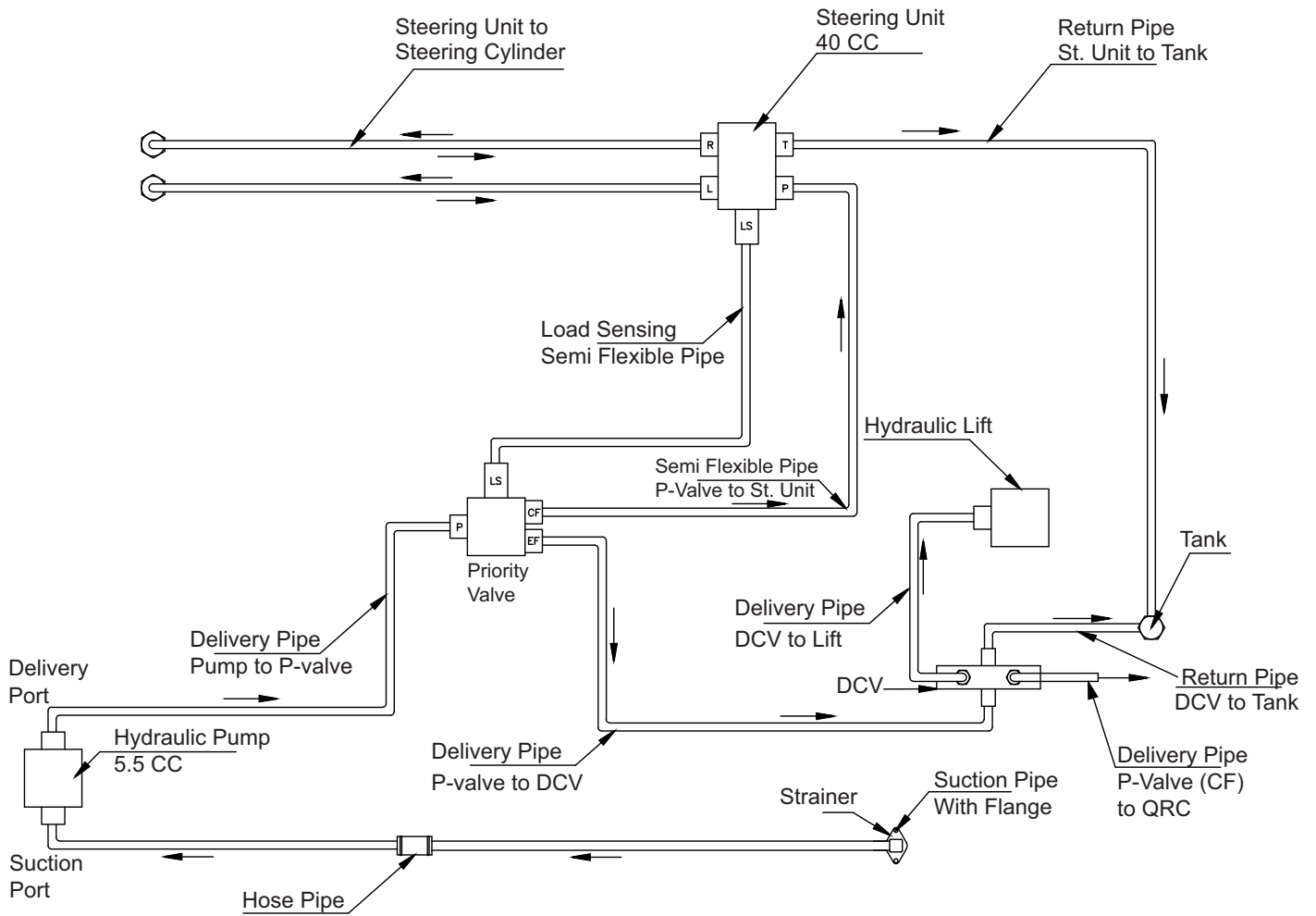


ÿ Remove the push rod as shown in figure.



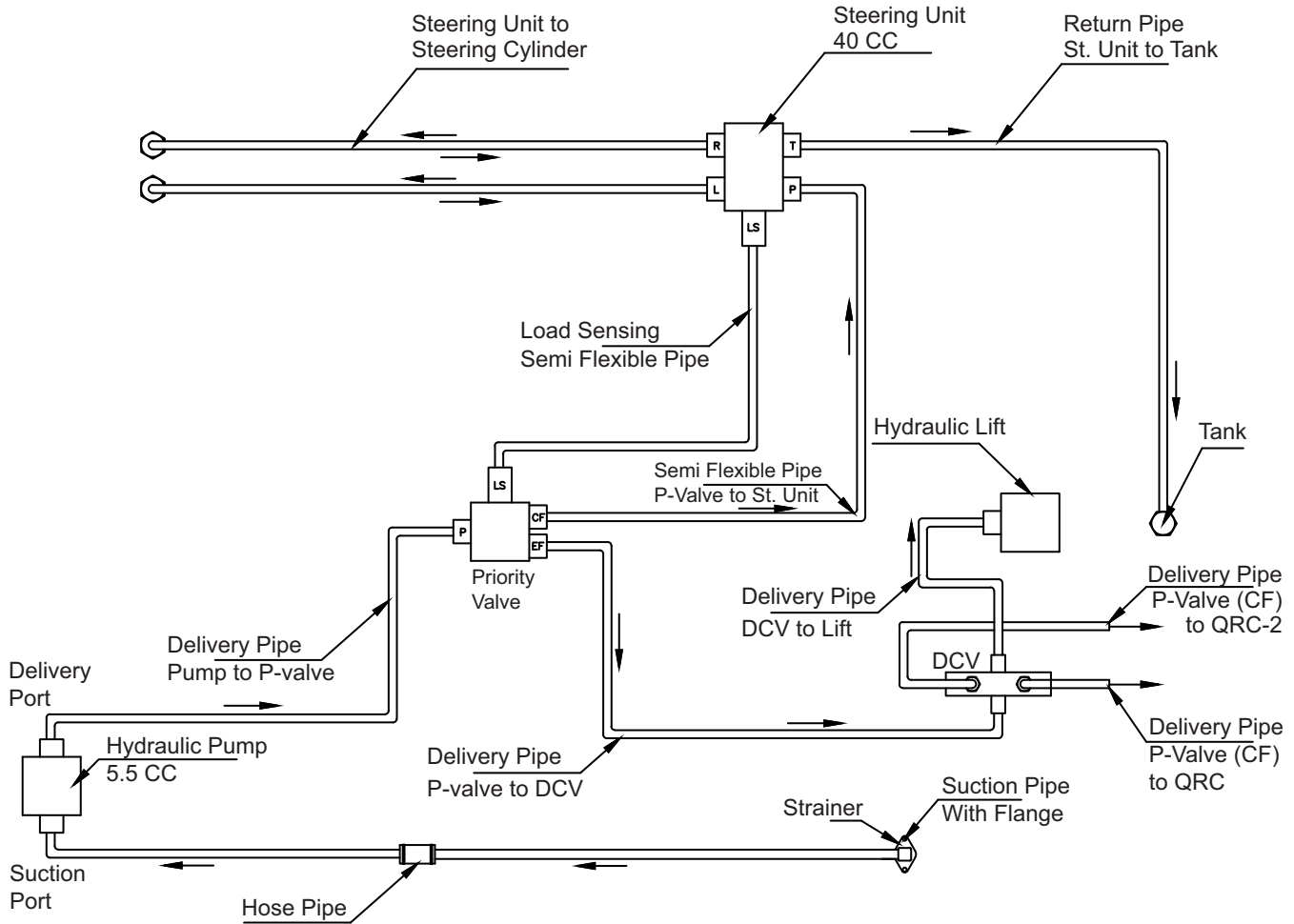
# HYDRAULIC SYSTEM

## H 5.0 HYDRAULIC CIRCUIT DIAGRAM OF MODEL 24/26 WITH SINGLE ACTING DCV CIRCUIT WITH PRIORITY VALVE UPTO 40 LPM



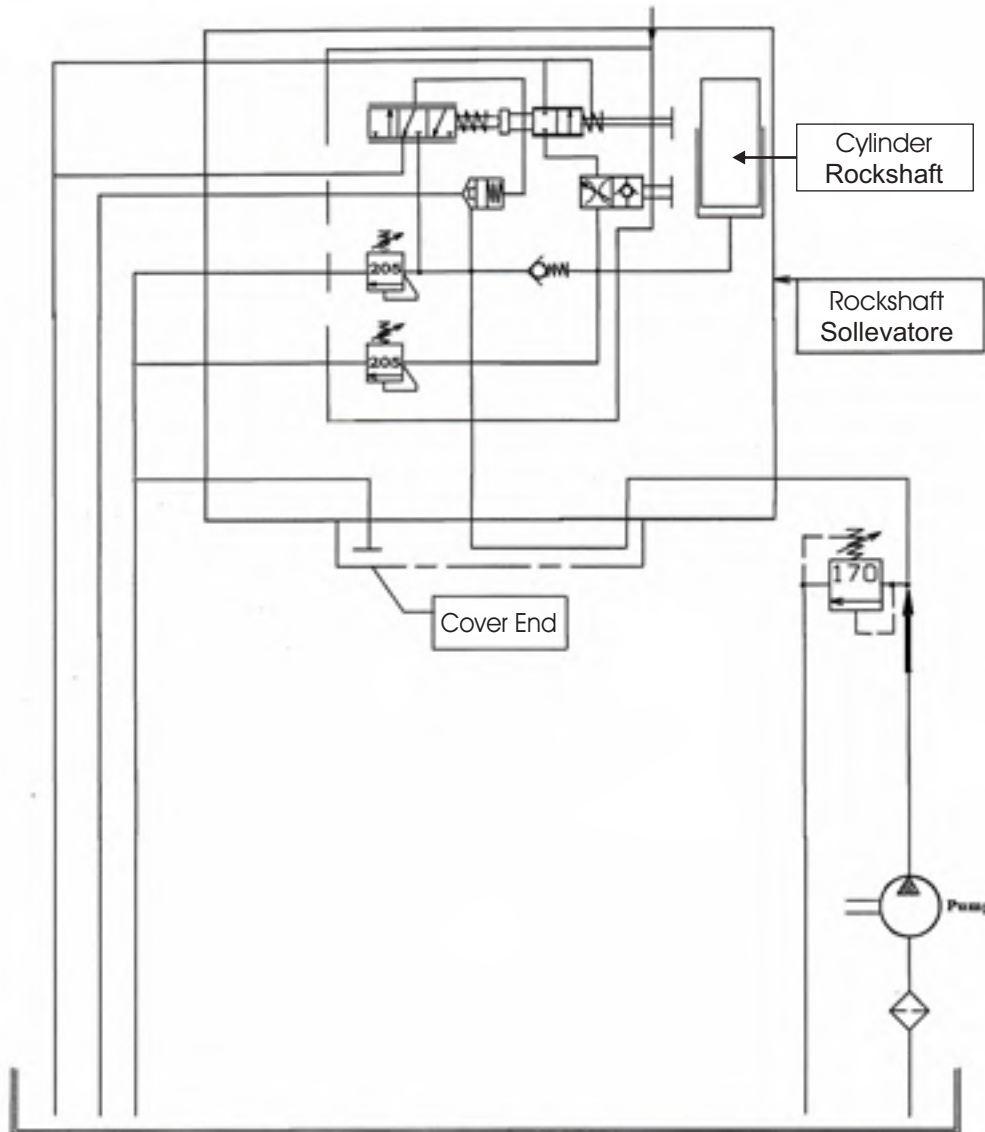
# HYDRAULIC SYSTEM

## H 5.1 HYDRAULIC CIRCUIT DIAGRAM OF MODEL-24/26 WITH DOUBLE ACTING DCV CIRCUIT WITH PRIORITY VALVE UPTO 40 LPM



# HYDRAULIC SYSTEM

## H 5.2 CIRCUIT DIAGRAM OF HYDRAULIC LIFTING DEVICE





## HYDRAULIC SYSTEM

### H 6.0 OPERATION OF POWER LIFT CONTROL VALVE ON- OFF

The control valve is pre-set to obtain three distinct phases:

**Neutral Phase**  
**Delivery Phase**  
**Discharge Phase**

#### Neutral Phase

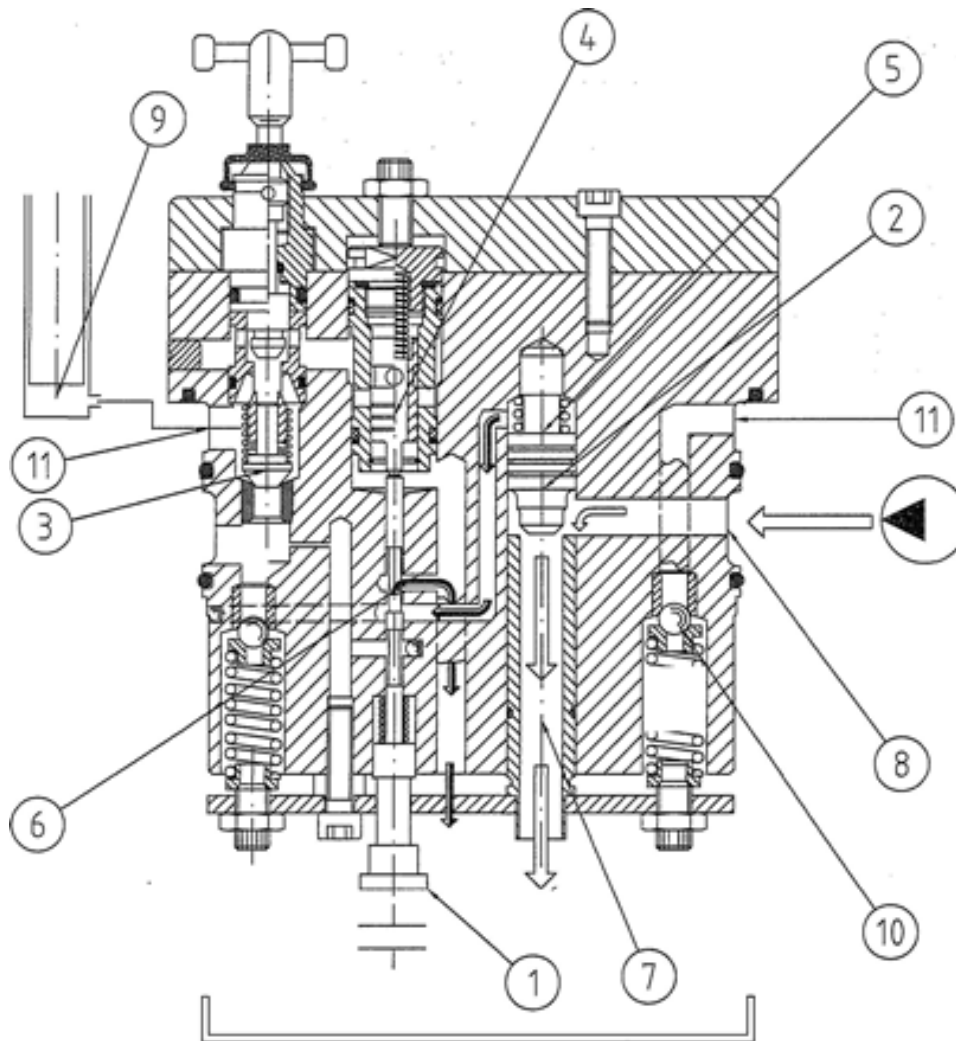
In this phase the control valve keeps pressure on the oil contained in the cylinder thus allowing the oil coming from the pump to flow freely to the tank.

In this phase the control spool "1" is in such a position to connect the chamber "5" of the differential valve "2" directly to the discharge through hole "6".

The oil coming from the pump enter the annular duct "8" will thus be able to move the differential valve "2" downward and thus opens the discharge hole "7" and the oil will flow to the tank.

The oil contained in the cylinder (Chamber 9) is kept under pressure by the check valve "3", by the discharge valve "4" and by the safety valve "10" connected to the cylinder "9" by the annular duct "11" thus holding the load applied to the lifting arms.

The safety valve "10" secures protection from any possible over pressure during the implement movement.



## HYDRAULIC SYSTEM

### Delivery Phase

During this phase the Control Valve supplies the oil under pressure to the cylinder "9" and it consequently lifts the arms.

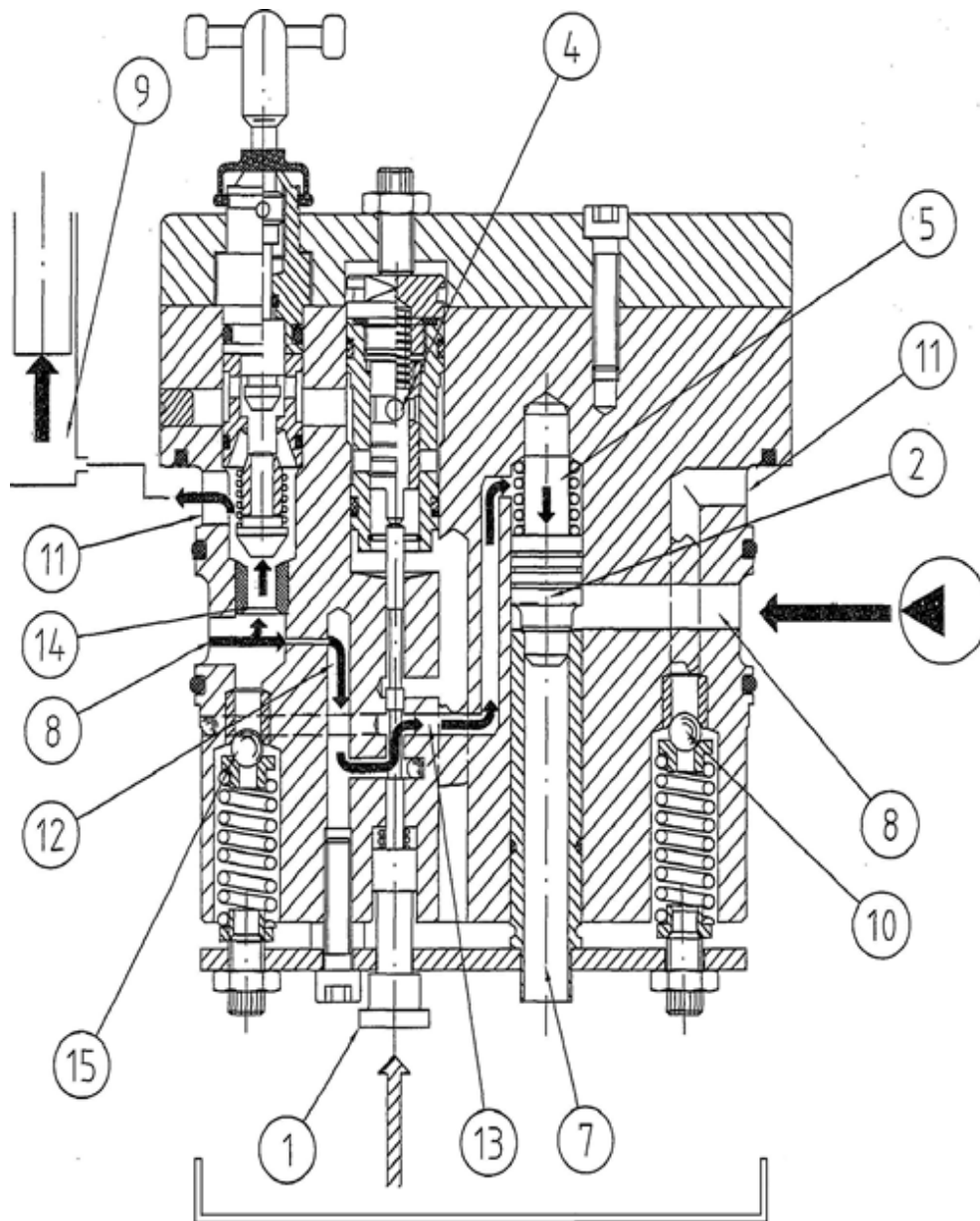
The Control spool "1" is in such a position to connect the chamber "5" of the differential valve "2" with oil coming from the pump through annular duct "8" and holes "12" and "13" making in this way the valve itself to close.

The oil from the pump finding the differential valve "2" closed goes to cylinder, pass the hole "14" opens the check valve "3" enters in the annular duct "11" and enters the chamber "9".

The lifting speed depends on the pump rpm.

In this phase the maximum lifting pressure is controlled by the safety valve "15" that is connected to the annular duct "8" through hole "14" and then to the oil inlet.

The external relief valve is directly connected to the inlet port of oil coming from the pump.



## HYDRAULIC SYSTEM

### Discharge Phase

During this phase the control valve supplies at the same time the oil coming from the pump and the oil contained in the cylinder to the discharge causing the lowering of the arms.

The control spool "1" is in such a position to connect chamber "5" of differential valve directly to the discharge through hole "6".

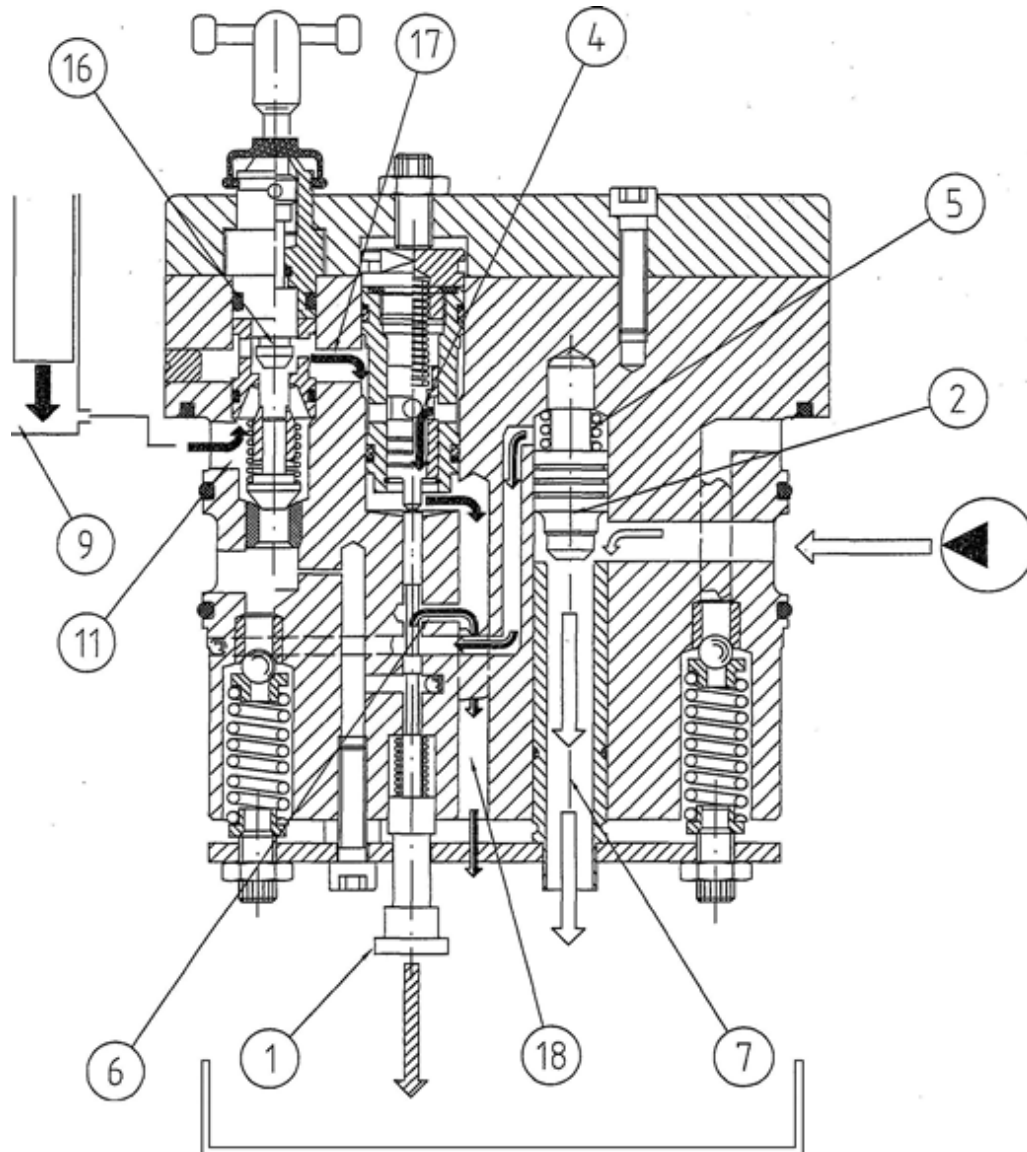
The oil coming from the pump enters in the annular duct "8" is able to move the differential valve "2" downward and open the discharge hole "7" and enables the oil go to the tank.

At the same time the pressure oil contained in the cylinder (chamber "9") flows to the tank therefore causing the lowering of arms.

From chamber "9" the oil goes into the annular duct "11" passing the lowering speed regulation valve "16" through the connecting hole "17" enter into the discharge valve "4" that is kept open from the spool "1" and goes to discharge from hole "18".

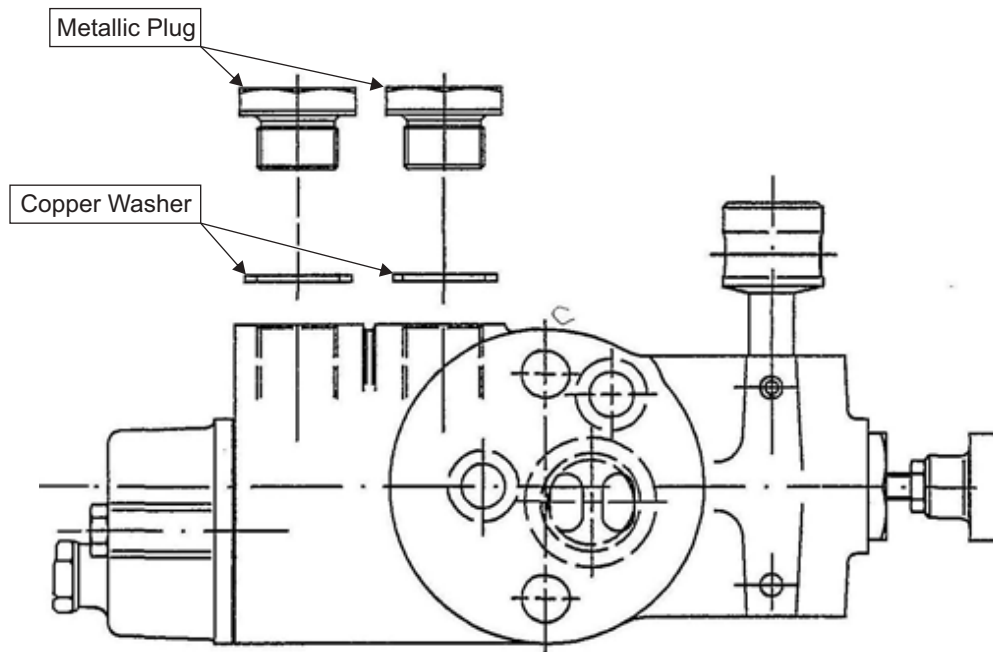
In this phase the lowering speed of the implement can be adjusted with the lever AP.

By screwing the lever the lowering speed is reduced, by screwing totally the valve "16" is closed on the seat and therefore the arms are locked for transport safety.



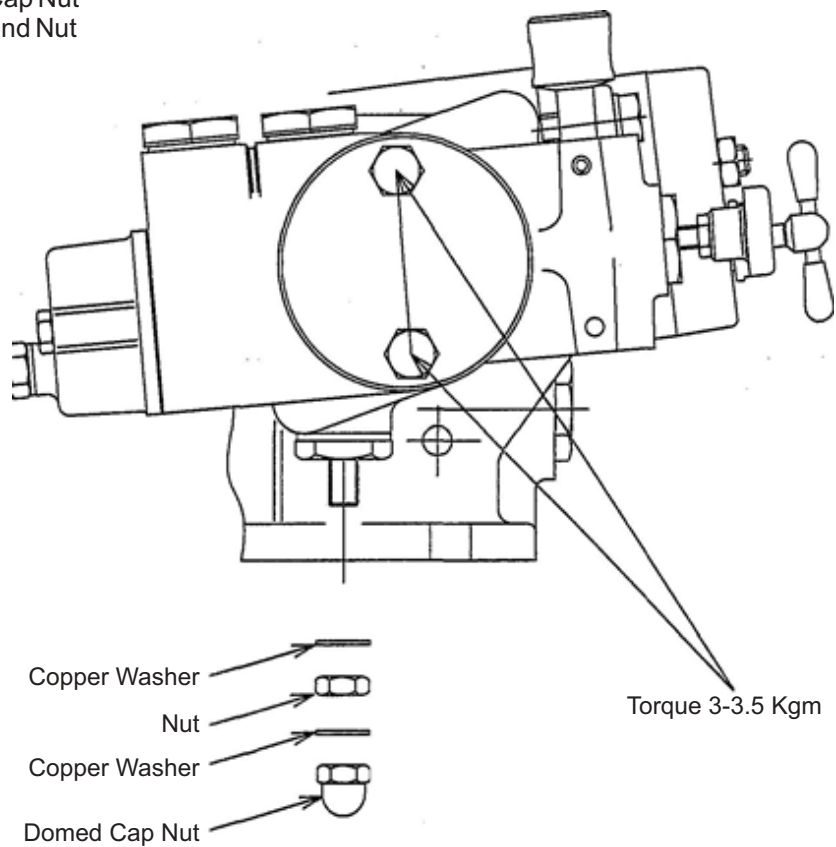
## HYDRAULIC SYSTEM

### Operation 1: Assembly the plugs and washers on Auxiliary valve



### Operation 2:

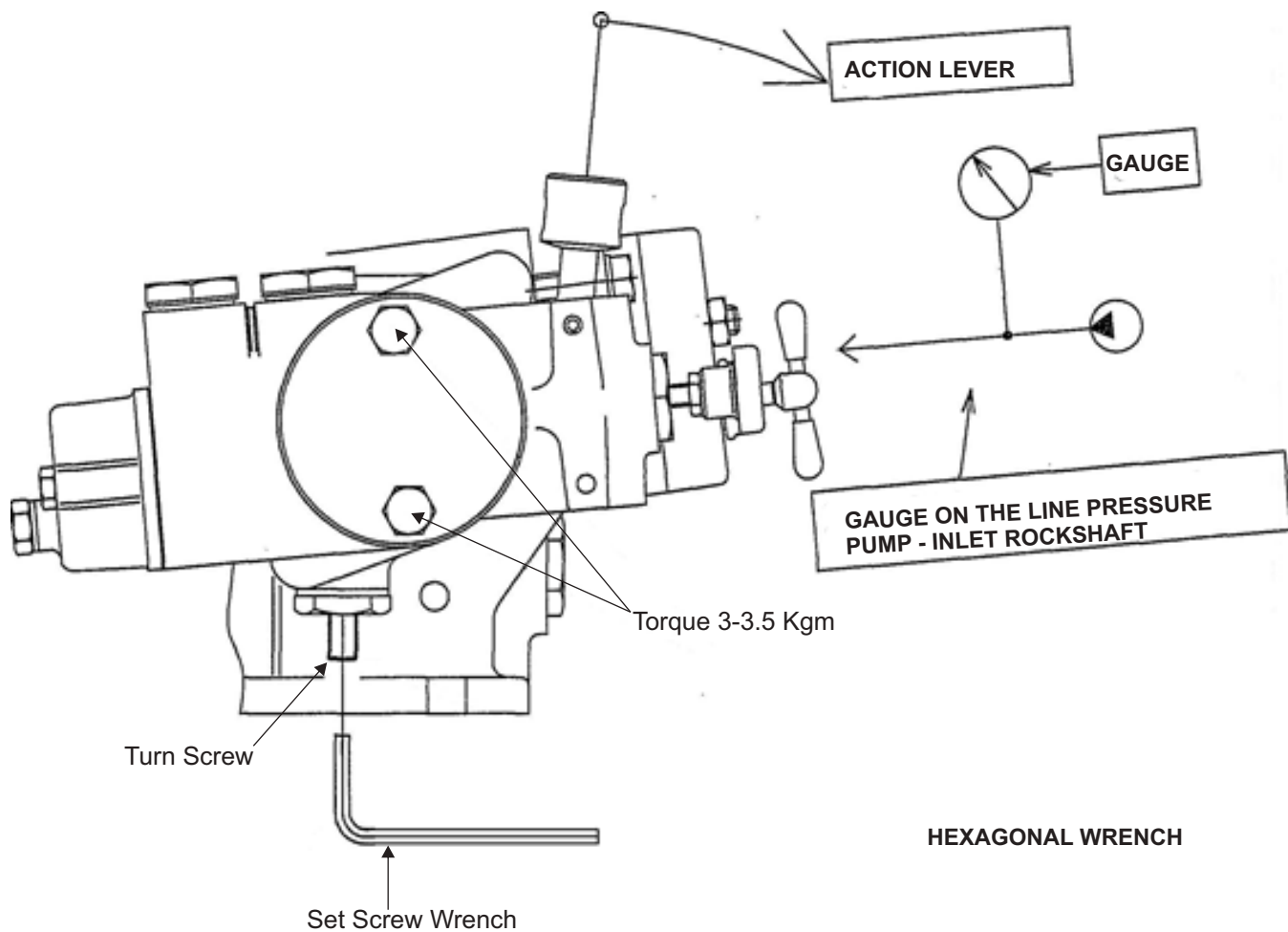
- ÿ Assemble the Auxiliary Valve on the Rockshaft
- ÿ Take Out Domed Cap Nut
- ÿ Copper Washers and Nut



## HYDRAULIC SYSTEM

### Operation 3:

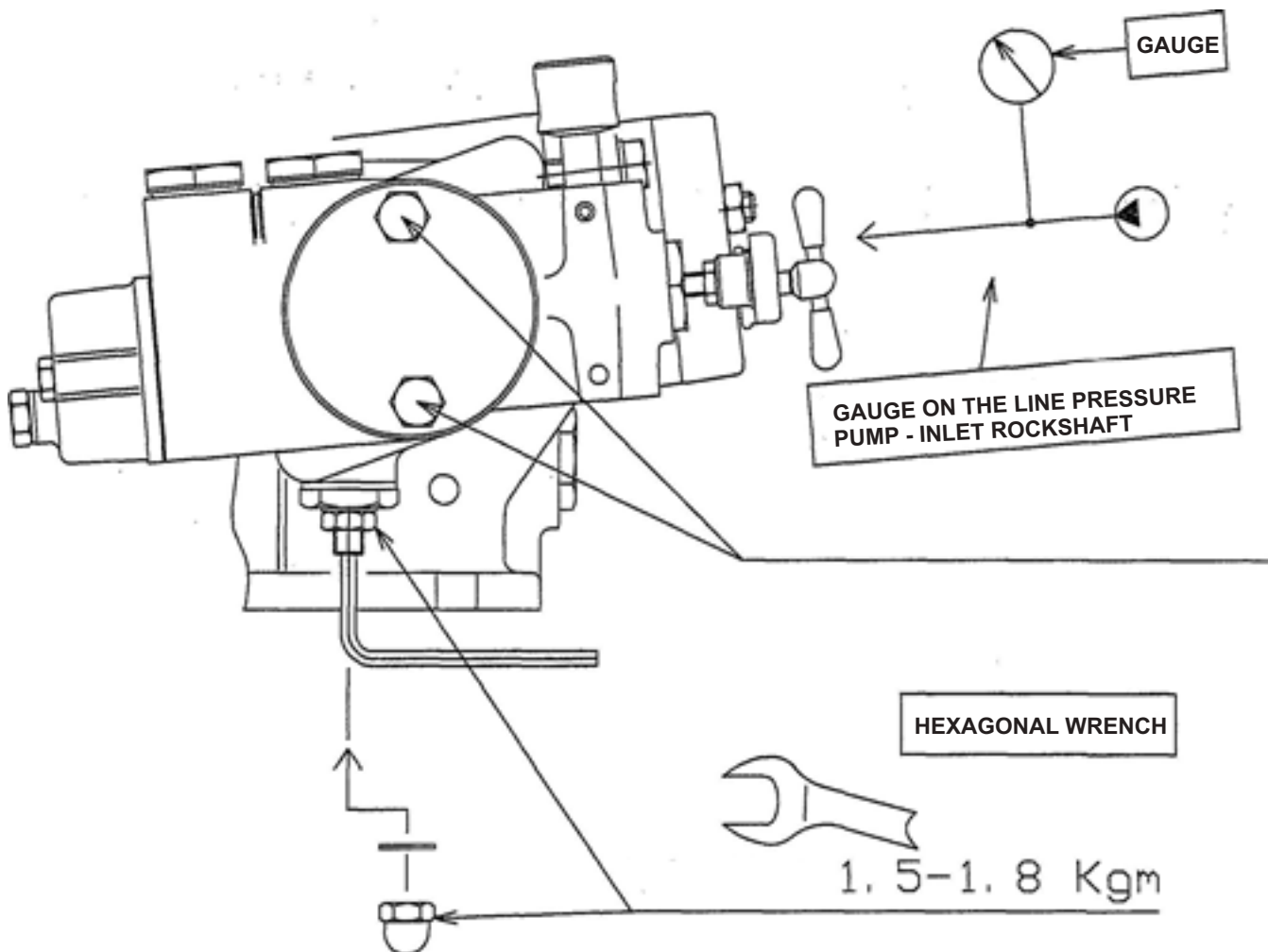
- ÿ Starting the tractor.
- ÿ Move the action lever on the auxiliary valve.
- ÿ Checking the pressure on the gauge and setting the pressure with setscrew wrench.
- ÿ Gauge to be used on pressure line from pump to inlet rockshaft turn the screw in clockwise direction for the increase of the pressure and turn in anti clockwise direction for the decrease of the pressure setting the relief valve at 170-175 bar (16-20 L/min).



## HYDRAULIC SYSTEM

### Operation 4:

- ÿ Return the action lever on auxiliary valve in neutral position.
- ÿ Block the screw with the nut and washer with hexagonal wrench.
- ÿ Recheck the setting of relief valve (move the action lever on the auxiliary valve).
- ÿ Return the action lever on auxiliary valve in neutral position.
- ÿ Assemble the domed cap nut and washer.
- ÿ Stop the engine.
- ÿ Take out the auxiliary valve.
- ÿ Take out the gauge.



## HYDRAULIC SYSTEM

### Operation of Internal Levers in Controlled Position:

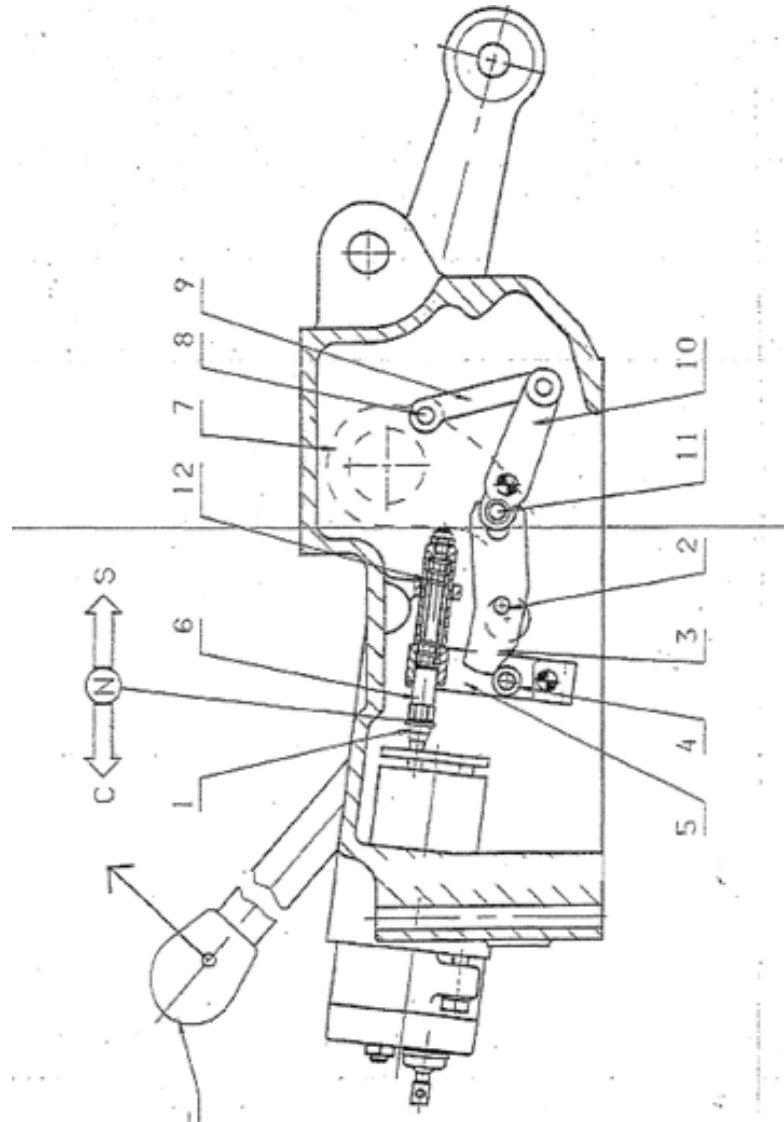
Moving the control lever "L" (In the direction of the arrow) one can raise the arms and the internal levers affect the Control Valve in the following way:-

The cam shaft "2" welded to lever "L" turns clockwise and rotates the cam lever "3" anticlockwise. This pushing on the roller cam bowl "4". Rotates anticlockwise the toggle lever "5" which due to the position of the push rod "6" moves the shaft "1" of the control valve in delivery phase (C) which consequently raises the arms of the rockshaft.

With the raising movement the crank "7" with its pin "8" rotate anticlockwise and by means of lever "9" they rotate the balance lever "10" in the same direction. The lever "10" with its roller cam bowls "11" cause a clockwise rotation of the cam lever "3". The roller cam bowl "4" remains in contact with the lever by the effect of springs of the shaft "1", so the toggle lever "5" rotates clockwise returning, by means of the push rod "6", the Control Valve in its neutral position (N) and blocking the raising of the arms.

When the arms are lowered the movement of the internal levers is in the opposite direction as described above.

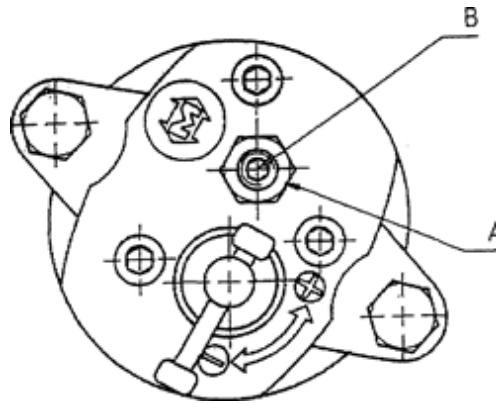
The push rod "6" is kept in a fixed position with the toggle lever "5" by the spring seat "12". The spring seat "12" has the function of absorbing the extra strokes of the internal levers when lever "L" is moved from its lowest position to its highest position and vice-versa.



## HYDRAULIC SYSTEM

In case of complete disassembly of the rockshaft it is necessary to make the follow adjustments:-

### 1. Adjustment of Control Valve Sensitivity

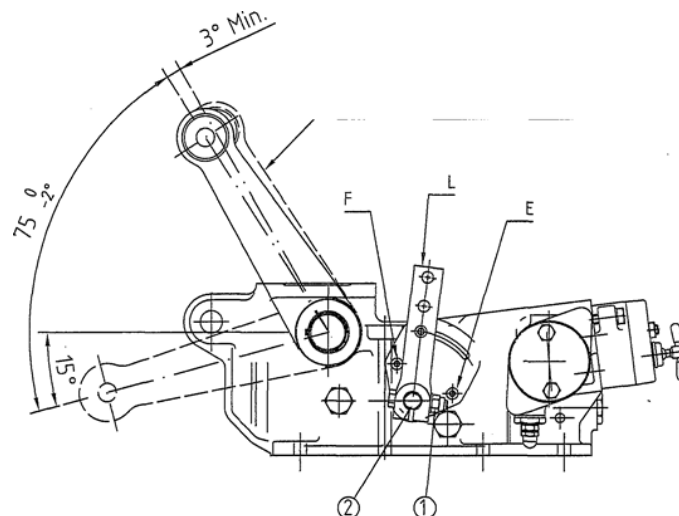


- ÿ Place The lift arms with the weight applied about the middle of the stroke so that the control valve is in the neutral phase.
- ÿ Operate now on Control Valve.
- ÿ Unscrew a little the nut "A" and then unscrew the screw "B" till the arms start to jerky.
- ÿ At that point screw again "B" till the movement of arms stops, then screw again for 1/4 of turn and lock the screw "B" with the nut "A".
- ÿ In this way the Control Valve is adjusted at the maximum sensitivity.

### 2. Adjustment of Position Control Lever

Completely lower the arms and apply a weight.

The adjustment is carried out in order to establish the maximum raised position, of the rockshaft lifting arms.



Loosen the fastening screw "1" so as to free the lever "L" from the position control shaft "2" Raise the lever "L" all the way toward backstop "F" without rotating shaft "2".

With a 13mm open end wrench, rotate slowly in an anticlockwise direction the position control shaft "2" so as to raise the arms. Continue the rotation until reaching the degree of 75° ± 2° (the maximum raised position).

Take care to maintain the position control shaft "2" blocked and the lever "L" against the backstop "F".



## HYDRAULIC SYSTEM

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Fix the lever to the shaft by tightening completely the clamp with the fastening screw "1".

Control by raising and lowering the lever "L" 3 or 4 times so that the arms always reach the same position at their highest position.

After concluding the adjustment always verify that there exists a security distance (minimum 3°) between the maximum raised position and the position of the mechanical backstop.

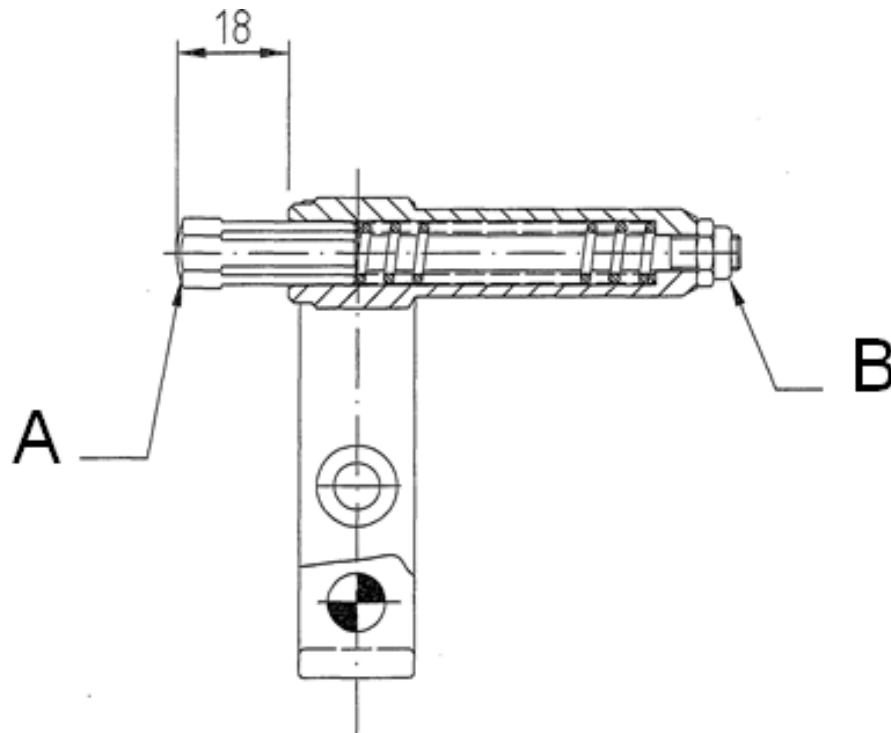
If the lifting arms reach the position of the mechanical backstop, the safety valve (relief valve  $170 \pm 5 \text{ Kg/ cm}^2$ ) intervenes with the danger of damaging the pump.

### 3. Assembly Measurement of Push Rod

This is an important measurement for the good functioning of the rockshaft.

If the rockshaft is adjusted and if the hydraulic group in the drawing is disassembled one must always restore the measurement of 18mm.

This measure is obtained by keeping the push rod "A" fixed and screwing or unscrewing the self-locking nut "B" until one reaches the specified measurement.

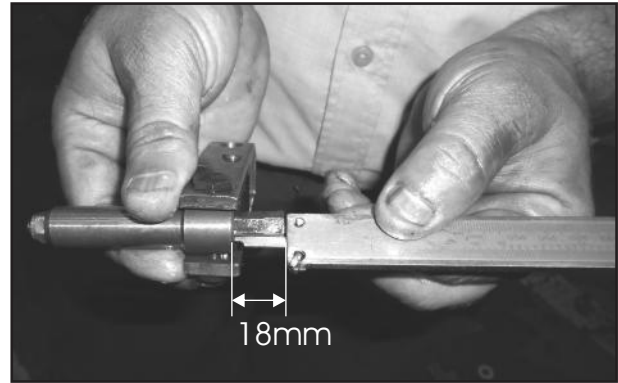


## HYDRAULIC SYSTEM

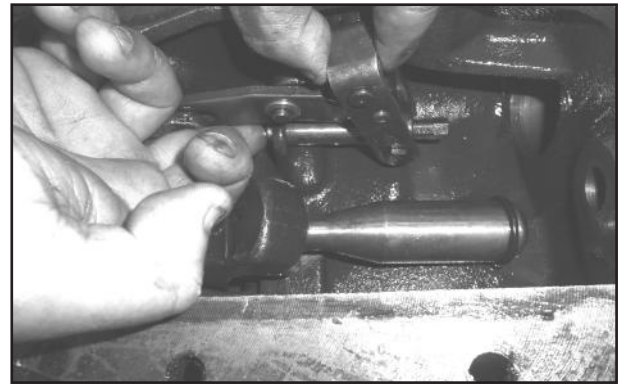
### H 7.0 RE-ASSEMBLY OF HYDRAULIC LIFT

#### Step - 1: Adjustment of push rod and linkage assy

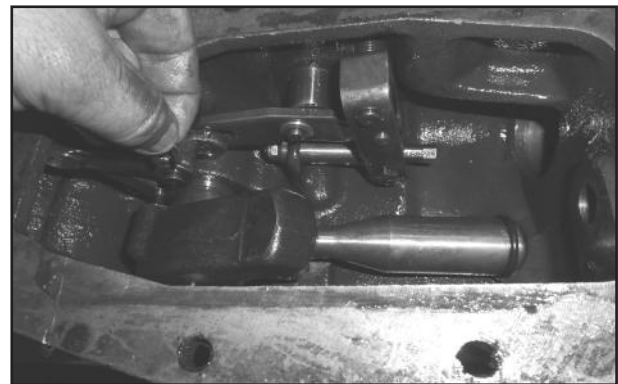
- *If the rockshaft is adjusted and if the hydraulic group is disassembled one must always restore the measurement of 18mm.*



- Assemble the push rod as shown in figure.



- Refit the lock pin (1) as shown in figure.



- Refit the lock pin (2) as shown in figure.



## HYDRAULIC SYSTEM

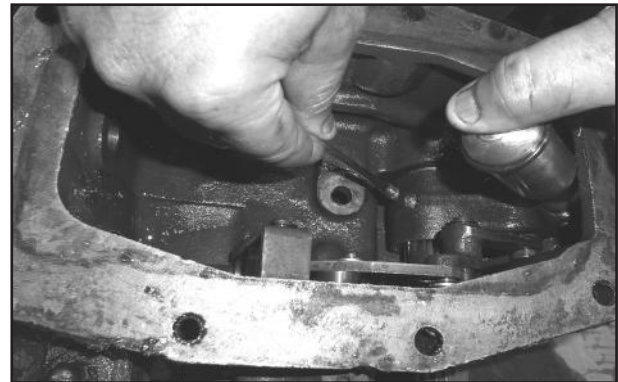
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### Step - 2: Re-assembly of Rock Shaft

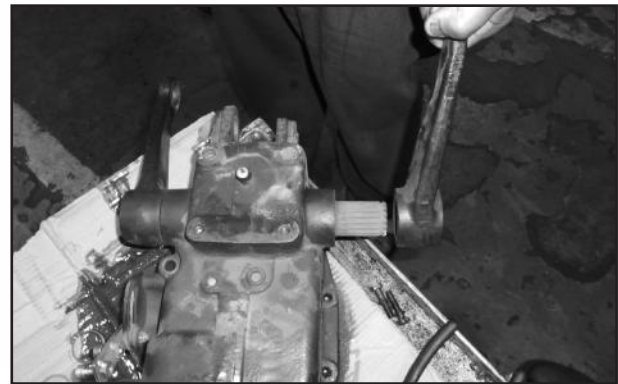
ÿ Refit the Rock Shaft by using hammer as shown in figure.



ÿ Tighten the screw plug from ram arm for assy of Rock Shaft as shown in figure.



ÿ Refit the lift arms by using hammer.



ÿ Lock the circlips from both ends of Rock Shaft as shown in figure.

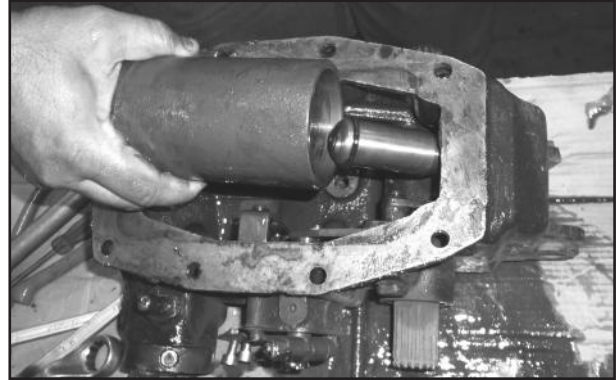


## HYDRAULIC SYSTEM

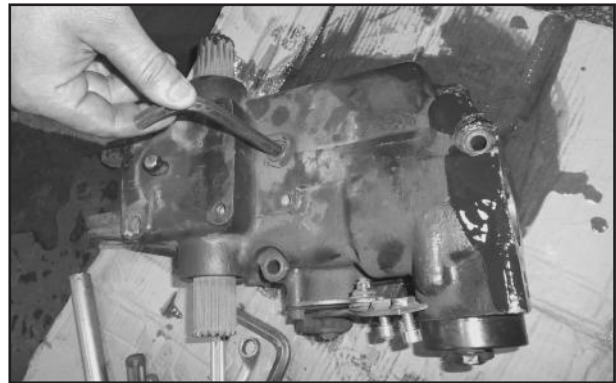
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### Step - 3: Re Assembly of Hydraulic Cylinder

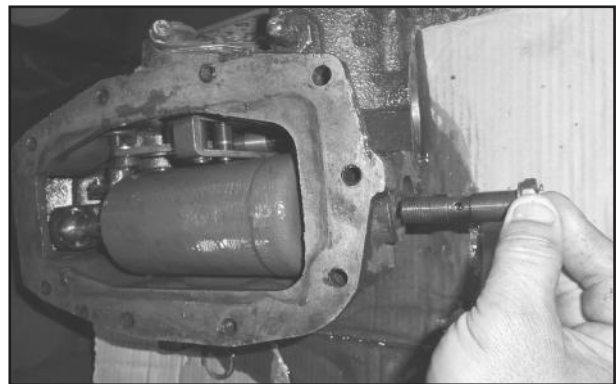
ÿ Fit the hydraulic cylinder inside lift body.



ÿ Tighten the allen screw at lift body for fitment of hydraulic cylinder.



ÿ Tighten the banjo bolt of hydraulic cylinder.



## HYDRAULIC SYSTEM

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### Step - 4: Re-assembly of Control Valve Assembly

- ÿ Refit the control valve assembly and tighten the hex bolts of control valve body.



### Step - 5: Re-assy of Hydraulic Lift with Transmission Housing

- ÿ Assemble lift body assembly with transmission housing by tightening hex bolts (9 nos).



## HYDRAULIC SYSTEM

### H 8.0 TROUBLESHOOTING OF HYDRAULIC SYSTEM

DRAWBACK	CAUSES	REMEDIES
The Rockshaft lifts, jerkily.	Insufficient oil level in the tank. Pump inlet filter clogged. Infiltration of air into the pump, inlet pipe.	Top up the level  Clean or replace the filter. Check the inlet pipe and any coupling and gasket.
Rockshaft does not operate.	Adjusting piston or pilot valve stuck.	Remove the control valve and unblock the pilot valve.
The Rockshaft does not descend over its entire travel.	Sensibility adjusted badly. Faulty adjustment of the control lever.	Adjust sensitivity of Control Valve, Adjust sensitivity of Position lever.
The Rockshaft does not descend.	Hydraulic block switched on. Outlet valve spring damaged Piston Blocked.	Unscrew the manual lever Change the spring. Check piston and cylinder
Lifting capacity does not match that-prescribed.	Safety-and over-pressure valves out of calibration. Poor pump efficiency. Poor Control Valve efficiency. Deterioration of the Control Valve seal rings.	Control calibration of the 2 valves. Replace the pump. Overhaul the Control Valve. Remove the Control Valve and replace the external seal rings.
The Rockshaft supports loads with difficulty, there is a rhythmic oscillation when the motor is on the load descends when the motor is off.	Piston gasket worn. Oil Leakage from cylinder. Oil Leakage from one of the following Control Valve, Non Return Valve Outlet Valve Safety Valve, Protecting the Cylinder.	Replace the gasket. Overhaul the Cylinder. Remove the Control Valve and overhaul the following valves Control Valve, Non Return Valve Outlet Valve Safety Valve, In case of Leakage over haul the Control Valve.
When the arms are in the upper position, the safety valve (Relief Valve) placed on the body of the Rockshaft starts operating.	Faulty adjustment of the max. upper position of lift arms.	Adjust the control lever, limiting the max. upper position travel.