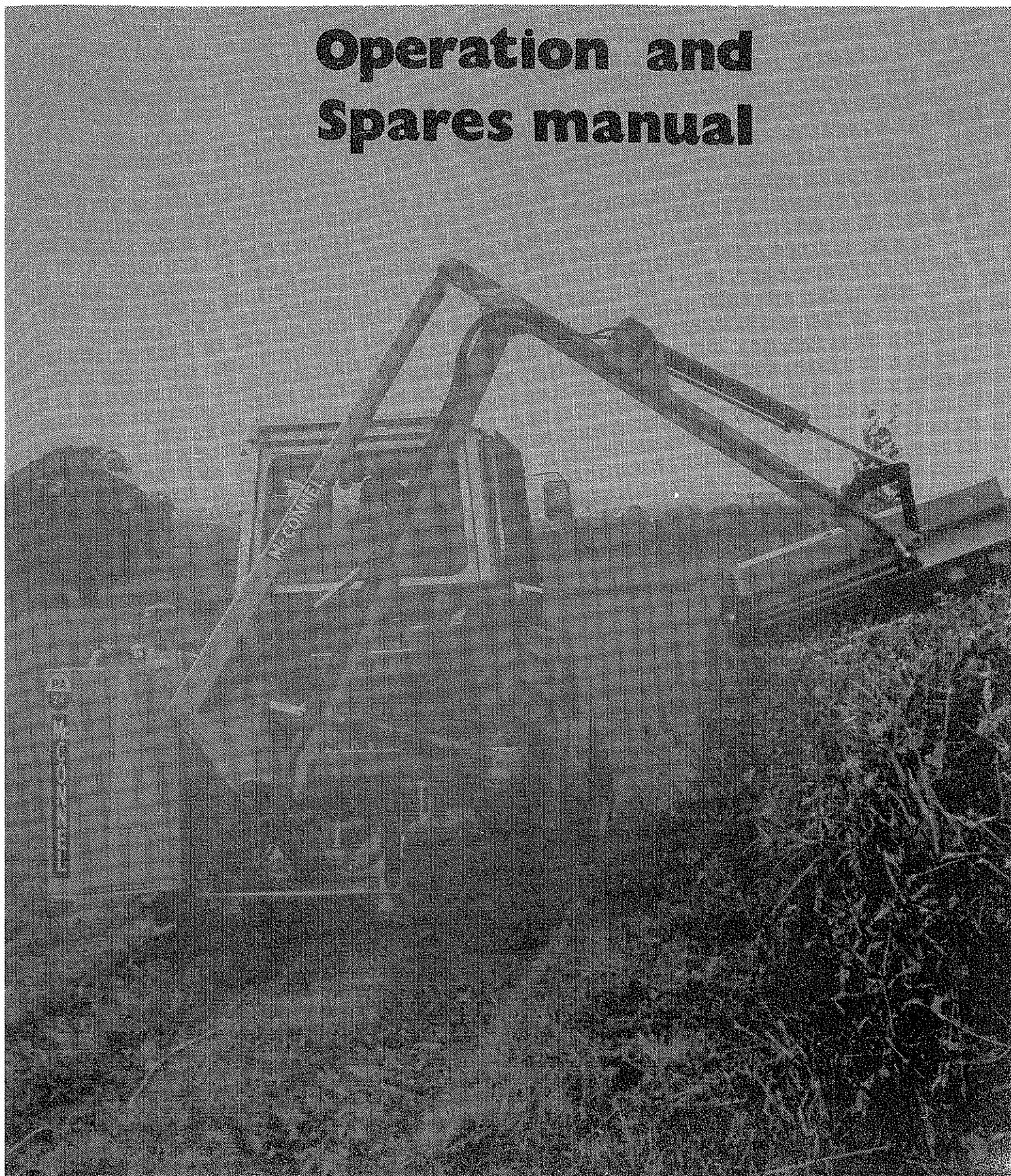


# POWER ARM 24

## Operation and Spares manual



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## GENERAL INFORMATION

Read this manual before fitting or operating the machine. Whenever any doubt exists contact your dealer or the McConnel Service Department for assistance.

Use only McConnel spare parts on McConnel equipment and machines. This manual includes an illustrated spare parts breakdown and the interpretation which precedes it should be read before ordering replacement components.

### DEFINITIONS

The following definitions apply throughout this manual:

#### WARNING

An operating procedure, technique etc., which can result in personal injury or loss of life if not observed carefully.

#### CAUTION

An operating procedure, technique etc., which can result in the damage of either machine or equipment if not observed carefully.

#### NOTE

An operating procedure, technique etc., which is considered essential to emphasise.

#### Left and Right-Hand

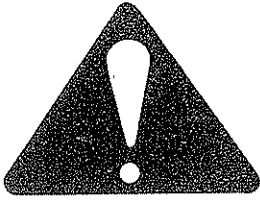
This term is applicable to the machine when fitted to the tractor and viewed from the rear. This also applies to tractor references.

Record the serial number of your machine on this page and always quote this number when ordering spares. Whenever information concerning the machine is requested remember to also state the type of tractor to which it is fitted.

MACHINE SERIAL NUMBER	INSTALLATION DATE
MODEL DETAILS	
DEALERS NAME	
DEALERS TELEPHONE NUMBER	

## SECTION 1

### SAFETY PRECAUTIONS

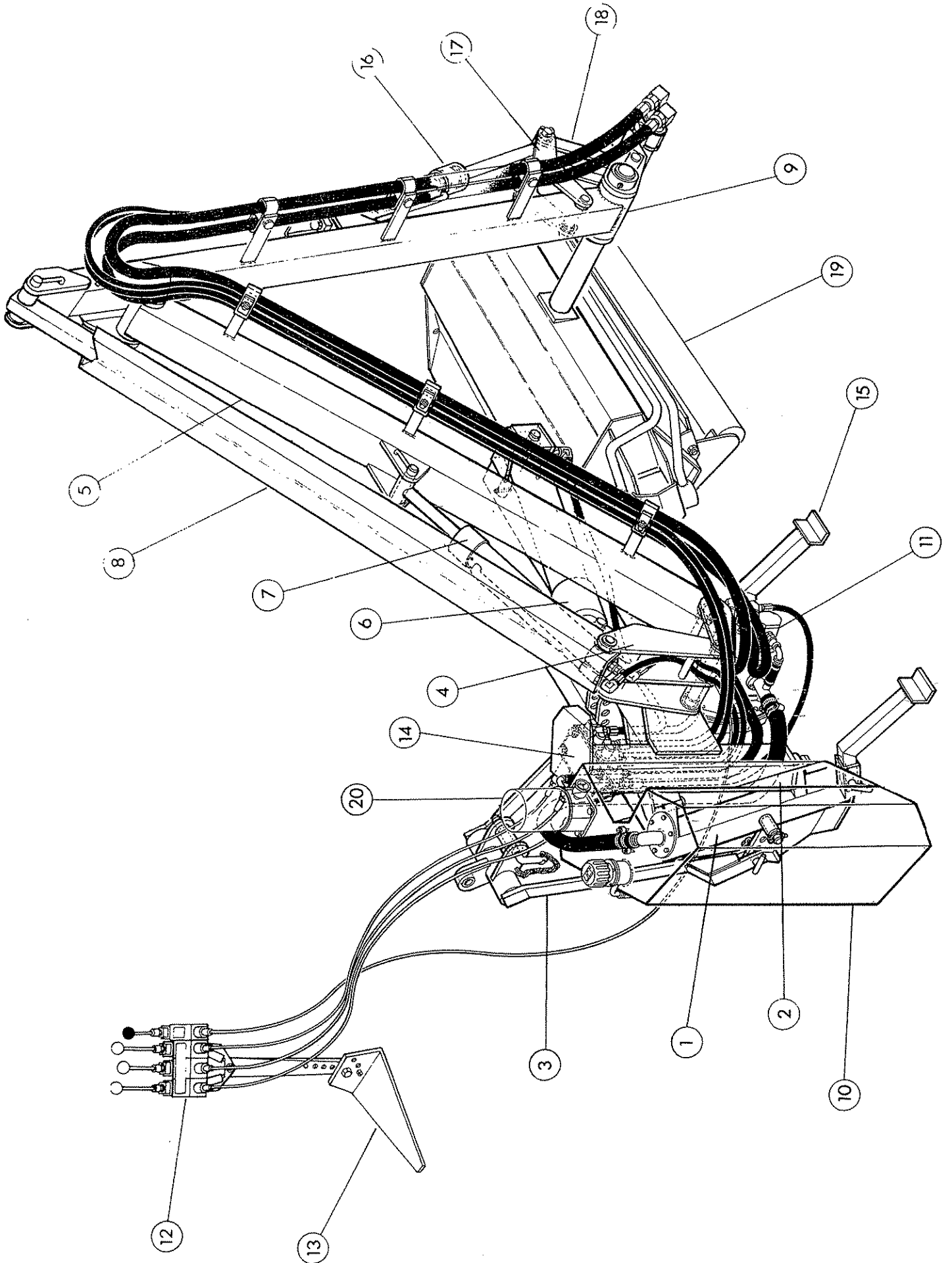


## WARNING

- NEVER ... permit inexperienced personnel to operate the machine without supervision.
- ... stand under the raised flail head.
- ... cut over the far side of a hedge with the flail cutting towards the operator.
- ... continue to operate the flail when wire has wrapped around the rotor.
- ... leave the tractor seat with the flail still rotating.
- ... operate the flail without the correct hood properly fitted in position.
- ... exceed 450 rpm on the pto shaft.
- ... stop the engine with the pto engaged.
- ... operate the machine without a cab safety guard.
- ... operate the machine without the pto shaft guard in position.
- ALWAYS ... inspect the work area or hedgerow for wire, steel posts, large stones, bottles and other dangerous materials and remove them before starting work.
- ... ensure bystanders are kept away from the machine during all flailing operations.
- ... check frequently, nuts and bolts for tightness and also check roll pins, shackles and flails for security.
- ... replace missing or damaged flails as soon as possible to avoid vibration and damage to the machine.
- ... disengage the pto and stop the tractor engine before making any adjustments.

CAUTION: One of the features of the Power Arm 24 is the ability to cut close to the tractor in confined spaces. This means that in some instances the flail head casing can be made to foul the tractor if reasonable care is not observed.

# GENERAL ASSEMBLY



## 1. INTRODUCTION

The Power Arm 24 is a fully independent hydraulically driven flail hedgetrimmer. It has been designed to fit on the three point linkage of the great majority of tractors without having to use extra brackets or fittings.

All power for operation of the flail rotor and for movement of the arms is provided by a tandem pump unit that is operated from the tractor's pto shaft. The machine carries its own oil reservoir incorporating a 10 micron full flow filter. The flail head has been designed to operate on the right hand side of the tractor only. Flail rotation can be altered for an upward or downward cutting action.

The flail head is equipped with two adjustable hoods to minimise the effect of flying debris and the operator is further protected by an operator guard which is attached to the tractor.

The controls are cable operated from within the tractor cab and the levers can be mounted in a number of different positions to suit the operator.

A self-resetting breakaway device allows the flail head to pivot back when an obstruction is met, it also allows the complete flail to be folded within the width of the tractor's wheels for travel on the highway.

The machine is complete with its own in-built stand and the minimum of effort is required for fast hitching on and off the tractor.

## 2 General arrangement

### Key to opposite page

1. Main frame.	11. Gearbox pump assembly
2. Tee frame	12. Control levers
3. Stabiliser yoke	13. Control lever mounting
4. Rocker	14. Hydraulic control valve
5. Main arm	15. Stand leg
6. Lift ram	16. Angling ram
7. Reach ram	17. Radius arm
8. Parallel link	18. Slave link
9. Dipper arm	19. Flail head
10. Hydraulic tank	20. Filter

### 3. Tractor selection

The Power Arm 24 will fit almost all tractors equipped with either Category I or Category II three-point linkage.

Tractor must be equipped with live drive independent PTO shaft to enable forward movement to be halted while the flail head continues to operate.

### 4. Draft control

Loads imposed through the draft sensing mechanism will not normally be sufficient to put a strain on the tractor, however any provision for draft control should be set to minimum response. Where a draft control rocker is fitted with a dead pin position this should be utilized.

### 5. Linkage isolation

Linkage isolation is not required as all tractor hydraulic controls should be neutralized.

### 6. Check chains/stabilizer bars

To hold the machine firmly in position check chains/stabilizer bars must be fitted. It is dangerous to operate the machine without.

### 7. Ballast weight

Irrespective of the size of the tractor, it must be stable whilst operating the Power Arm 24 under all conditions. Due regard must be paid to operating on slopes, and front end ballast as well as rear wheel weights to counterbalance the overhang of the flail head should be added as appropriate. On steeply banked ground it may not be sufficient to depend on the counterweight afforded by the oil reservoir.

In addition rear wheel track should be as wide as practicable to increase stability. It will also increase the protection to the reservoir.

## SECTION 2

### FITTING & REMOVAL INSTRUCTIONS

#### 1. Fitting operator guard

The Power Arm 24 is supplied with an operator guard kit part number 73 13 324 which must be fitted to the tractor before commencing work.

It consists of two areas of wire mesh which can be shaped to suit and secured against the cab window with spring loaded hooks, the upper edge being anchored around the cab gutter and the lower edge around the mudwing.

Owing to the great range of cabs it may be necessary to adapt or make brackets to secure the mesh.

A tractor fitted with a cab that has safety glass windows should be used whenever possible. This is a basic safety precaution applicable to the use of all flail-type hedge trimmers.

Where the flail is operated on a tractor that is equipped with a safety frame or roll bar only, then an additional frame must be made and fixed to the tractor onto which the guard mesh can be secured. In addition to the guard mesh, a sheet of Polycarbonate transparent glazing must be fitted to the frame to provide further operator protection. This material must also be used when the cab does not have safety glass installed.

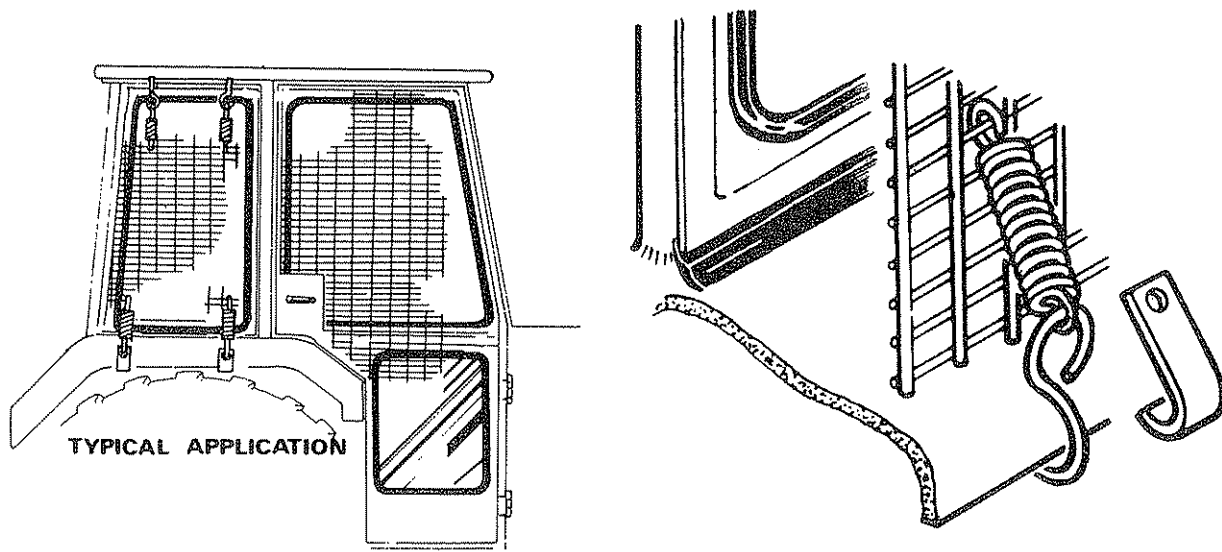
Polycarbonate transparent sheeting is an impact resistant material which can be readily sawn and shaped to requirements. To prevent damage to the surface a toughened grade of Polycarbonate which is resistant to scratching is recommended.

Polycarbonate sheeting is obtainable under brand names such as :-

"Makrolon", "Tuffak", and "Lexan".

In case of difficulty in obtaining this material locally, contact F.W.McConnel Ltd through your usual dealer.

#### CAB GUARD

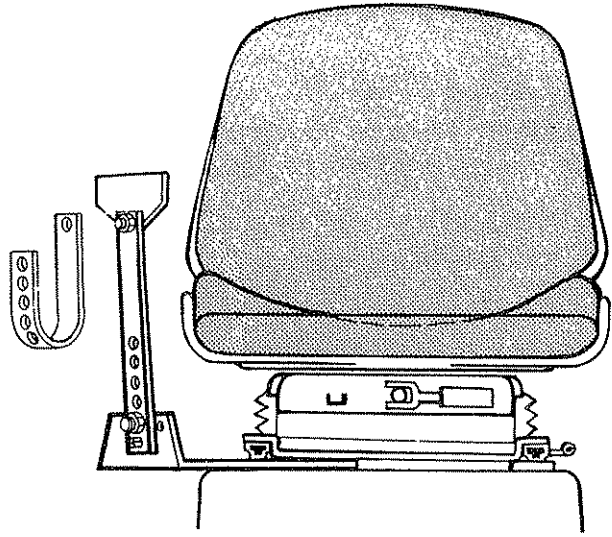




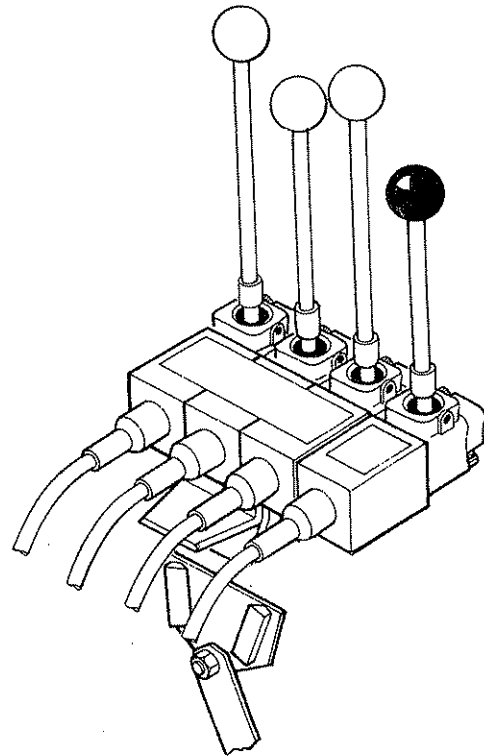
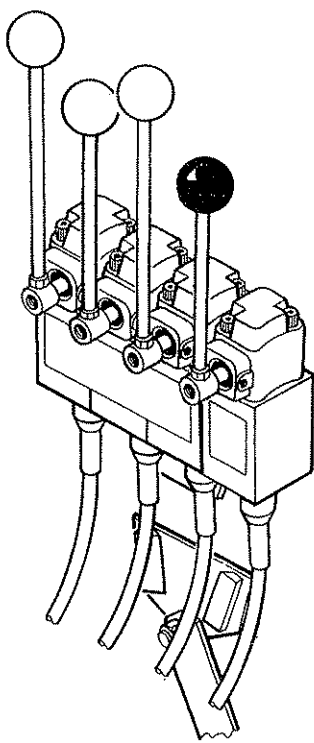
## 2. Fitting of control unit in cab.

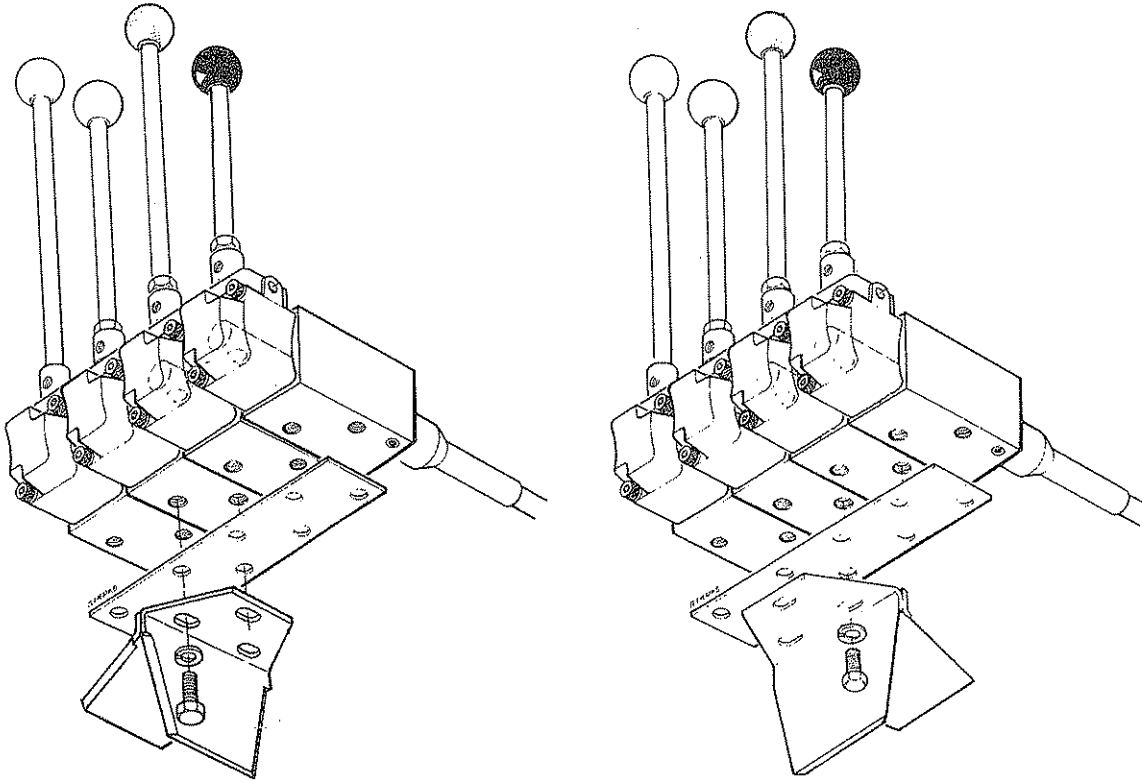
The control box is mounted on an adjustable stalk that is attached to a seat bracket which is of universal design for mounting in many models of tractor. The bracket is normally trapped between the seat runners and their mounting base. It may sometimes be necessary to drill extra holes in the seat bracket to find the ideal operator position.

On tractors other than silent cab models it is permissible to attach the control unit to the mud-wing or the cladding of the cab observing the precaution that no structural member of the safety frame should be drilled. For this purpose the mounting stalk can be bent round in a 'U' shape.



The control unit itself is bolted to a two-way spigot which allows for horizontal or vertical mounting as space or preference dictates. The spigot can also be bolted to the control box in a transverse or longitudinal position thus giving a greater choice of mounting positions. The levers also have alternative mounting holes in their ball-end trunnions to allow them to be operated vertically if the control box is placed in a vertical position.





Shown above is detail of alternative fitting of the mounting spigot. In deciding the final position of the control box, remember that tight bends in the cables will reduce their operational life. Do not exceed the minimum acceptable bend radii of 8".

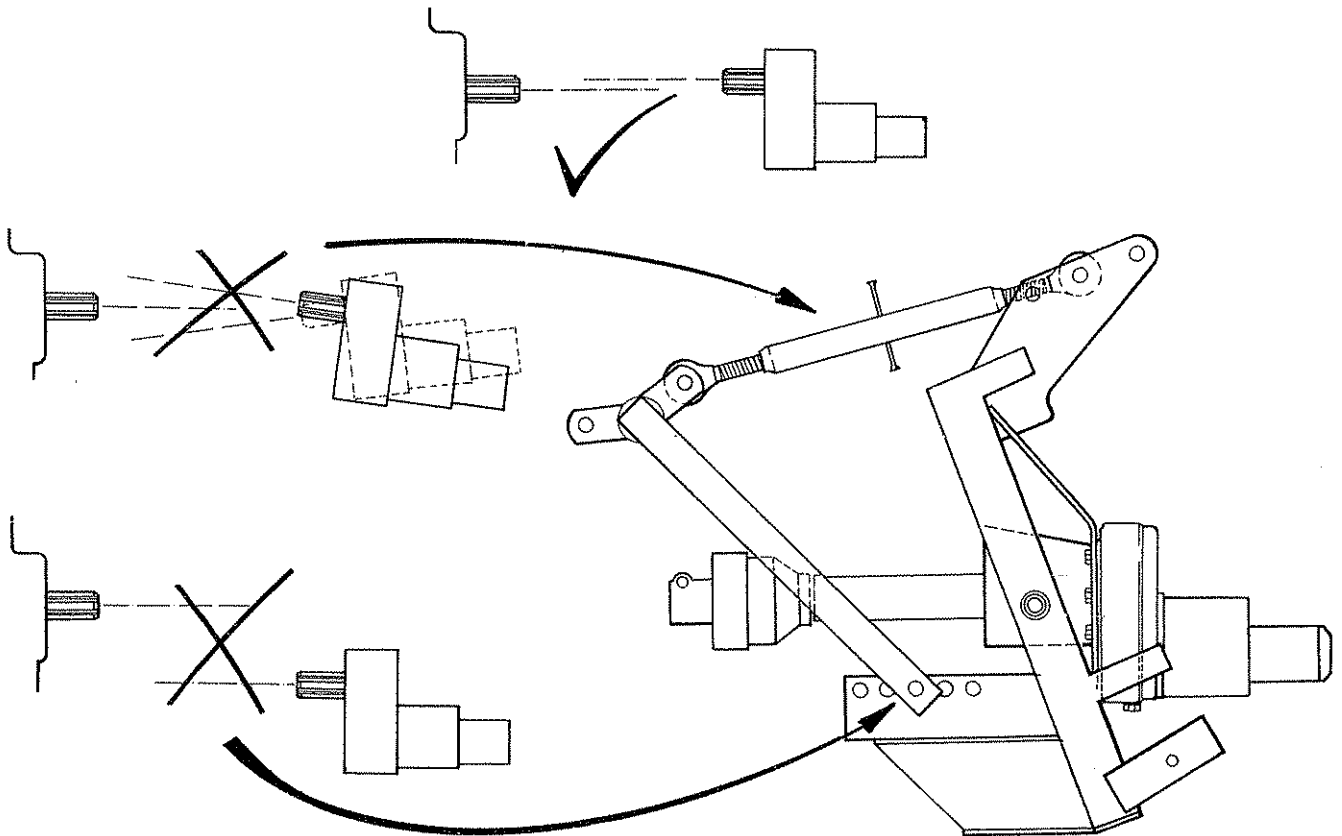
### 3. Machine attachment

Note: Although it is possible for one person to attach the machine to the tractor, the job is made considerably easier if assistance is given.

- i) Adjust tractor drop arms to enable the draft links to lower within 30 cms (12") of the ground.
- ii) Remove the top link and machine yoke completely.
- iii) Reverse tractor squarely to the front of the machine, engage draft link pins and secure.
- iv) Attach yoke to the top hitch position on tractor ensuring lug for the top link is uppermost.
- v) Install top link between yoke and upper hitch position on machine. If necessary, fitting Cat. I sleeves into the ball ends of the top link.
- vi) Raise the machine on the tractor linkage to enable the lower yoke pins to be assembled to the main frame. Select a hole position so that when the weight is taken by the yoke, the main frame is approximately upright and level. It may be found necessary to operate the lift lever to keep the flail head on the ground.
- vii) Lower quadrant lever so that the machine's weight is taken by the tractor.

- viii) Install PTO drive shaft to the tractor. It is essential that the shaft is not allowed to 'bottom out'. There should be a minimum of 25mm(1") of further travel before the shaft is fully closed. This measurement should be taken carefully before cutting off both the driving and driven members of the tube by an equal amount. Likewise the plastic shield will similarly have to be cut. Take heed that if too much is cut off, it cannot be stuck back on !

Ideally the tractor stub shaft and the gearbox shaft should be in a straight line. The greater the misalignment, the shorter will be the expected working life of the powershaft joints. Parallel adjustment is affected by the top link and vertical alignment is adjusted by the hole selection between the yoke and the main frame.



- ix) Ensure that the collar locking devices on the PTO shaft are fully engaged and wrap the torque chain around the tractor drawbar or any convenient point to prevent the shaft guard from rotating.
- x) Final adjustment of the top link to bring the main arm upright and use of the tractor lift arm levelling box to bring the main frame horizontal should be further checked when the armhead weight is taken by the frame.
- xi) Tighten up the check chains or adjustable stabilizers to hold the machine rigid without sideways.
- xii) Remove parking feet, turn through 180° and relocate in their housings.
- xiii) Release the control lever assembly from its parking spigot on the main frame and pass through rear window or access aperture in the cab. Relocate on its operating spigot alongside the tractor seat.

#### 4. Machine removal

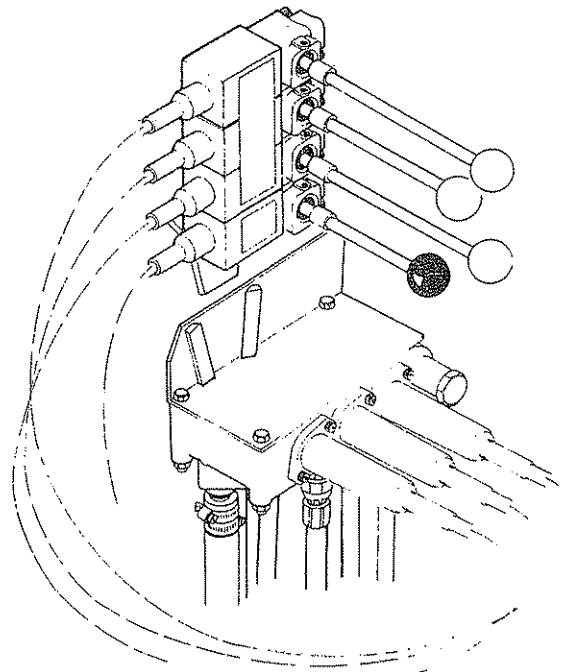
- i) Select a firm level site for parking the machine.
- ii) Extend the reach ram to place the flail head flat upon the ground about 1 metre away from the tractor's rear wheel.
- iii) Disengage tractor pto.
- iv) Disconnect stabilizer bars or loosen off check chains as applicable.
- v) Remove parking legs turn through 180° and replace and secure them in their housings.
- vi) Disconnect and remove the pto shaft from the tractor.
- vii) Raise the machine on the tractor's linkage to take the weight off the yoke and remove the lower yoke pins.

Note: On some tractors this will require re-selecting the hydraulic linkage operation,

- viii) Lower the tractor draft links to place the machine firmly on the ground. It may be necessary to move the angling and lift levers at the same time to enable the flail head to remain flat on the ground.

- ix) Adjust the top link until the machine is stable on the ground and no weight remains on the link pins and then remove the top link completely.

- x) Remove the control assembly from the operating spigot in the cab and re-locate on its parking spigot on top of the main frame. Mount the control assembly on its side to avoid moisture collecting in the leverwells or alternatively place a plastic bag over the complete unit to afford protection.



- xi) Remove draft links from machine, drive tractor forward and remove the yoke.

Note: If machine is to be left standing for an extended period of time, lightly coat the exposed portions of the ram rods with grease. Subsequently this grease which becomes contaminated with dust and grit should be wiped off before the rams are next moved.

## 5. Hydraulic installation

- i) The Power Arm 24 is delivered from the factory without oil. Fill the reservoir until the oil level is approximately half-way up the sight tube with a light hydraulic oil as recommended in the chart. The total capacity is approximately 100 litres (22 galls). Do not overfill.

Supplier	Cold or temperate climate	Hot climate
Castrol	Agricastrol hydraulic oil Hy-spin AWS32	Hy-spin AWS68
Shell	Tellus 27	Tellus 33
Mobil	D.T.E.25	D.T.E.26
Esso	Nuto 'H' or 'A' 32	Nuto 'H' or 'A' 68

- ii) Check the gearbox oil level. Oil should be visible in the sight plug. Top up if required with E.P. 90 lubricant. The gearbox is normally despatched filled with oil.
- iii) Ensure that the rotor control is in "STOP" position, start tractor, engage p.t.o. and allow the oil to circulate for about 20 minutes without operation of the armhead control lever. This will allow all the oil to thoroughly circulate through the return line filter.
- iv) Operate the armhead levers, ensuring that all movements are functioning correctly.
- v) Place the flail head at a safe attitude and move the rotor control to "START" position. After initial fluctuation due to priming, the rotor should settle to a steady speed. Increase p.t.o. speed to approximately 360 rpm and run for a further 5 minutes before disengaging and stopping tractor.
- vi) Check the hose runs and observe that they are free from any pinching and chafing. Re-check the oil level in the tank and top up as necessary.

## Section 3

### OPERATION

#### 1. Limitations

The Power Arm 24 has been designed as a light to medium weight hedgetrimmer; is ideal for work on hedges that have been regularly maintained and is capable of making a reasonable job in one to two years growth. The machine is worked from the right hand side of the tractor only and the rotor has been designed to cut in either direction. Heavily overgrown or badly neglected hedges should be tackled with a shapew.

#### 2. Highway working

If it is intended to cut roadside hedges or to work in the vicinity where the public have access, it is a statutory requirement that suitable warning signs are placed at both ends of the work area. These signs should not be more than ½ mile apart (.8 Km). To further promote highway safety, the use of headlamps and a flashing beacon on the cab roof would be beneficial. Hazard warning lamps should not be used since an oncoming vehicle could easily misjudge braking distance in presuming the tractor approaching them is stationary.

#### 3. Operator guard

Owners are reminded that it is illegal to use a flail without an efficient operator guard. The guard supplied as standard equipment with each machine attaches to the tractor cab with spring loaded hooks.

#### 4. Preparation

Before commencing work, the operator should read the instruction manual thoroughly, paying particular attention to the SAFETY PRECAUTIONS printed in the front of the manual. It is the operator's responsibility to ensure that a safe code of practise is followed.

If the operator is unfamiliar with the control levers and thus the reach, height and angling of the flail head, a worthwhile exercise is to make a dummy run alongside a hedgerow with the rotor stationary.

The work area or hedgerow should be carefully inspected for wire, steel posts, large stones, bottles and other dangerous materials and removed. The position of any immovable objects should be particularly noted or identified i.e. with a fragment of plastic sack to avoid running into them with the flail. Should the rotor accidentally strike anything of a hazardous nature, the machine should be immediately stopped and the rotor examined for damaged or missing flails which should be replaced to retain rotor balance. Continuing to work the flail head with the rotor out of balance will cause vibration which can rapidly damage the rotor bearings.

#### CAUTION:

The ability for the flail head to work closely alongside the tractor wheel in narrow lanes and for transport to fold within the overall tractor width can present a possible hazard for the flail head to contact the mud wing, rear lamp cluster etc., and cause damage.

Caution should be exercised when operating under these conditions and particularly, if it is required to fold the machine within the tractor's width, The breakaway strut should be locked back to give ample clearance for the flail head when it is placed on its end at rest on the top of the mainframe.

5. Engaging drive

Ensure that the rotor control lever is moved to the "STOP" position before engaging the pto shaft. Allow the oil to circulate for a minute or so before operating the armhead levers. Position the flail head in a safe position, increase engine speed to high idle and move rotor control lever to "START". After initial surging the rotor will run at an even speed. Starting the rotor in this way reduces starting loads imposed on the hydraulic motor and drive splines.

6. Operating speed

Do not run the PTO at 540 rpm.

The machine should be run at a speed no higher than is needed to make a clean cut with no fall off in rotor speed. This also allows better control of the tractor and reduces the tendency of the operator to "ride the clutch pedal".

Run the tractor engine to give a pto speed of 400 - 420 rpm.

This will give a corresponding rotor speed of 2150 - 2250 rpm.

WARNING

Maximum working speed should never exceed 450 rpm on the PTO shaft.

7. Forward speed

Tractor ground speed is determined by common sense and experience. It should be slow enough to allow sufficient time for the flails to cut the work without overloading. It is obviously better to make a second pass or more in heavier growth to avoid undue strain.

8. Tractor position

The position of the tractor in relation to the hedgerow will again be determined by experience. For a normal straight forward hedgerow the position should be such as to allow the reach ram to be in mid-stroke. This effectively allows the reach to be adjusted in either direction without altering the tractor's position.

## 9. Hedge-shape

Local practice and customs as well as the requirement; be it a stockproof barrier, a windbreak to resist soil erosion or as a sanctuary to protect wild life will each have their part to play in influencing the desired finished shape of the hedgerow.

A hedge cut in the shape of an 'A' although rather wider and so taking up more ground will be encouraged to send out new growth from the bottom. The stubby ends from the ground to the top can further discourage stock and the wide dense bottom will promote conservation of wild life.

A hedge with vertical sides and an apex top is an alternative which has found favour in many parts of the country. The sloping top encourages light to penetrate and promote growth in the lower regions of the hedge. The sloping top also assists to shed heavy falls of snow which can accumulate and break a hedge down.

Although a box-shaped hedge, flat across the top and with square corners may look very tidy in its early stages it is prone to dying off in the bottom while being encouraged to grow in the top. After a few years this type of hedge can become 'buck-headed' and is always susceptible to damage by snow.

## 10. Cutting sequence

Operator preference will ultimately decide on the order of cutting. Where it is difficult to determine the original hedge line because of overgrowth, a recommended method is to start by siding up the hedge first, if necessary making more than one pass.

A second cut should then be taken at an incline along the hedge top and again if there is prolific growth it may be necessary to make more than one pass until the hedge is reduced to the height and contour required.

Finally, finish with a ground cut and for this, the roller should be lowered. This ground cut defines the base line of the hedge, severs brambles and rubbish that encroach out from the bottom, and further mulches the toppings that have fallen.

Note: Flails are more prone to accidental damage and blunting by stones on a ground cut. Therefore when convenient this should be left to the last.

Where the hedge has been well maintained in the past it may be found better to cut the top before siding up.

### WARNING

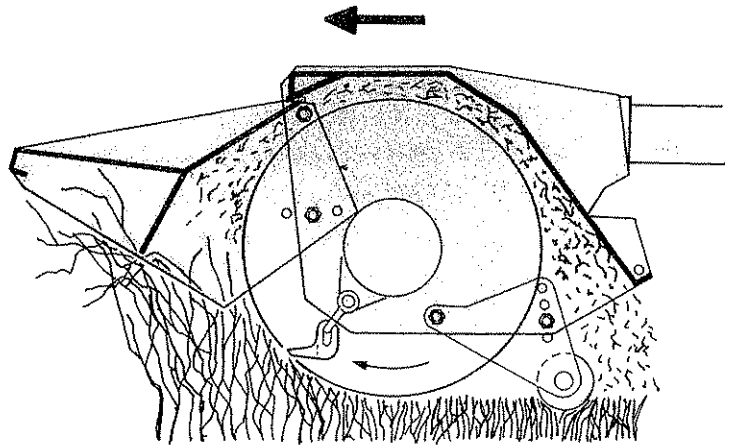
Do not be tempted to make a vertical cut on the far side of the hedge. This would entail cutting 'blind' and the rotating flail would be capable of throwing debris through the hedgerow in line with the operator.

Where both sides of a roadside hedge are to be cut, always cut the field side first. The uncut roadside helps to reduce the amount of debris being flung through the hedge into the road. Also by sloping the vertical cut to give an 'A' shape, debris is thrown down into the hedge bottom and the spread of material is reduced.



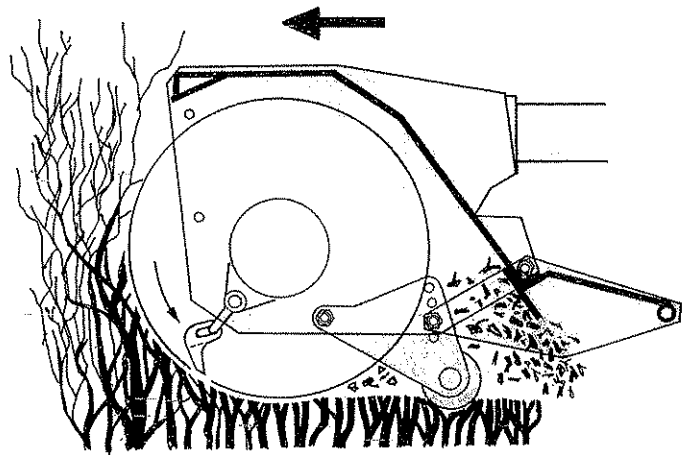
11. Upward cutting

The flail head is normally assembled at the factory for the flails to cut with an upward motion and in this configuration the larger of the flail hoods must be mounted at the front. Upward cutting produces a cleaner finish, minimises split stems and is ideal for a light hedge that has been regularly maintained. Whether or not the smaller flail hood is mounted at the rear is a matter of choice but for roadside working, its use will minimise the spread of debris.



12. Downward cutting

For heavy growth the rotation of the rotor can be reversed to cut downward in a chopping action. It is permissible to remove the front hood to allow larger material to pass under the flail head. The rear hood must be left in position.



13. Reversing rotation

Fully extend armhead and lower flail to ground to minimise oil loss. Release and interchange the two flail drive hoses at the rotor control valve.

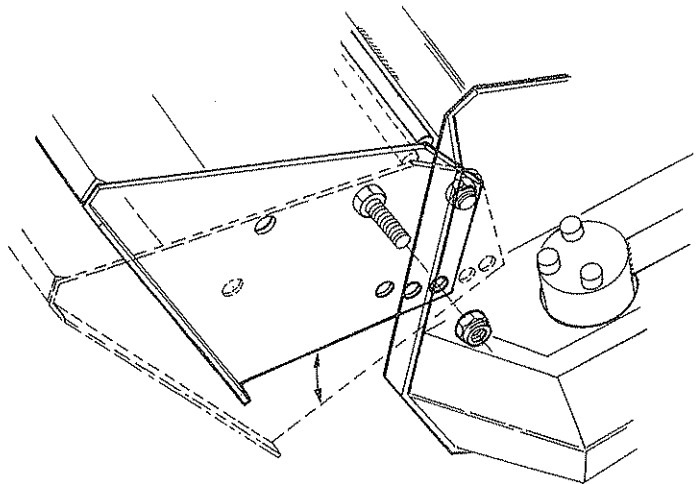
The flails mounted on the rotor must also be turned round by releasing the bolts and locknuts, withdrawing the flail pivot pins and reversing the shackle/flail assemblies.

WARNING

If any wire is picked up by the rotor, the machine should be stopped immediately and the rotor cleared before proceeding.

14. Flail hoods

Both the flail hoods are hinge mounted by bolts to the front and rear of the head and provision is made for the front hood to be adjusted in three working positions. To minimise the throwing of debris particularly when roadside working the hood should be adjusted to its lowest position. When the front hood is fully raised, larger growth can pass underneath but with the greater tendency for material to be thrown. The front hood must always be in place for upward cutting and the rear hood must always be in place for downward cutting.

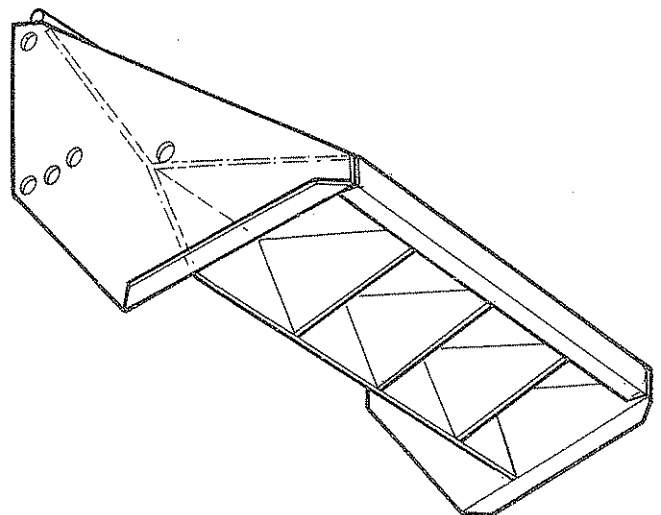


Note: The two hoods are not interchangeable on the flail head.

15. Wire trap

Both flail hoods are equipped with a wire trap. The trap consists of a steel plate welded across the underside. Any loose ends of wire which are picked up and carried round by the rotor are cut by the edge of the metal plate and fall harmlessly to the ground. This plate should not be interfered with or modified in any way.

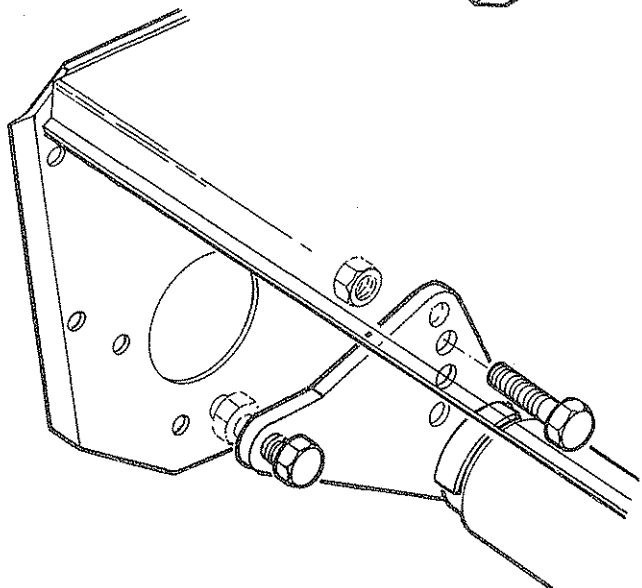
Furthermore this wire trap does not relieve the operator of the responsibility of checking and cleaning the flail when it is suspected that wire has caught in the rotor.



16. Roller

The roller is adjustable vertically to four positions, when hedge cutting the roller should be set higher than the flails. The roller helps to prevent the flail head from bouncing and sinking into the hedge and so assists in maintaining a level cut.

For making a ground cut the roller should be lowered below the cutting level of the flails. This helps prevent 'scalping' the ground and picking up stones which are injurious to the flails.



Never attempt to operate the flail without the roller in position. It shields the flails and reduces the chances of long lengths of cut material being thrown.

17. Breakaway action

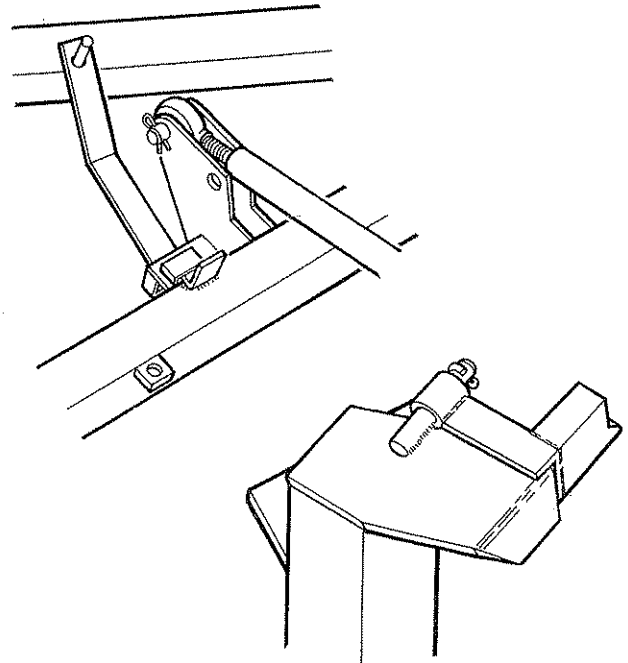
When the flail head meets an obstruction and the tractor continues to move forward, the complete armhead which is hinged on the frame will be forced backwards and upwards at the same time in an effort to clear the obstruction. Resetting of the breakaway is completely automatic with the armhead returning to its working position under its own weight.

18. Transport position

With the armhead in the working position at right angles to the main frame, the flail can be raised and folded to close proximity of the tractor wheel. Where it is desirable to fold the machine to within tractor's overall width it is necessary to lock the armhead back in the breakaway position by engagement of the breakaway lock pin.

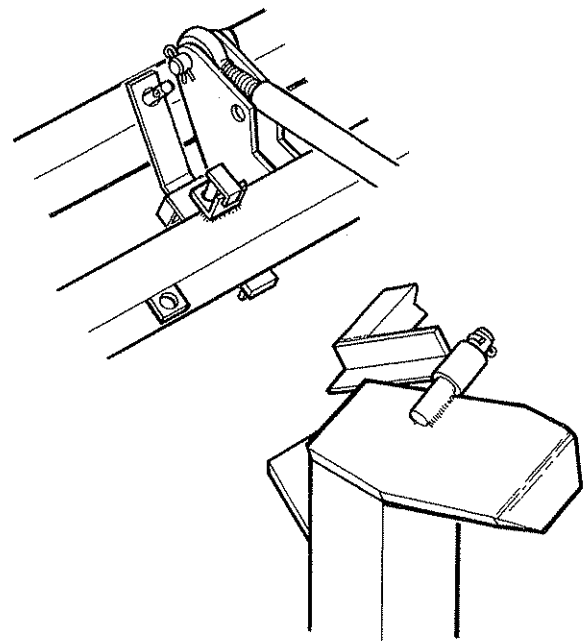
This is best done by releasing the lock pin, placing the flail head on the ground and driving forwards, while at the same time operating the 'main arm down' lever.

The released lock pin will drop in and locate itself behind the breakaway bar when maximum position is reached. The transport stop which is hinged on the top of the frame should be swung into position so that when the armhead is raised it will not travel too far to overhang the left hand side of the tractor. The flail head should then be angled inboard to a vertical position and rested on top of the main frame.



19. Working position

To revert back to the working position it is only necessary to place the flail head firmly on the ground, drive the tractor forward sufficiently to take the weight off the breakaway bar, when the lock pin can then be raised and turned so that its head is held against the protruding lug on the frame. The transport stop may then be flipped over out of the way of the main arm if it is desired to cut in close confinement of the tractor.



## Section 4

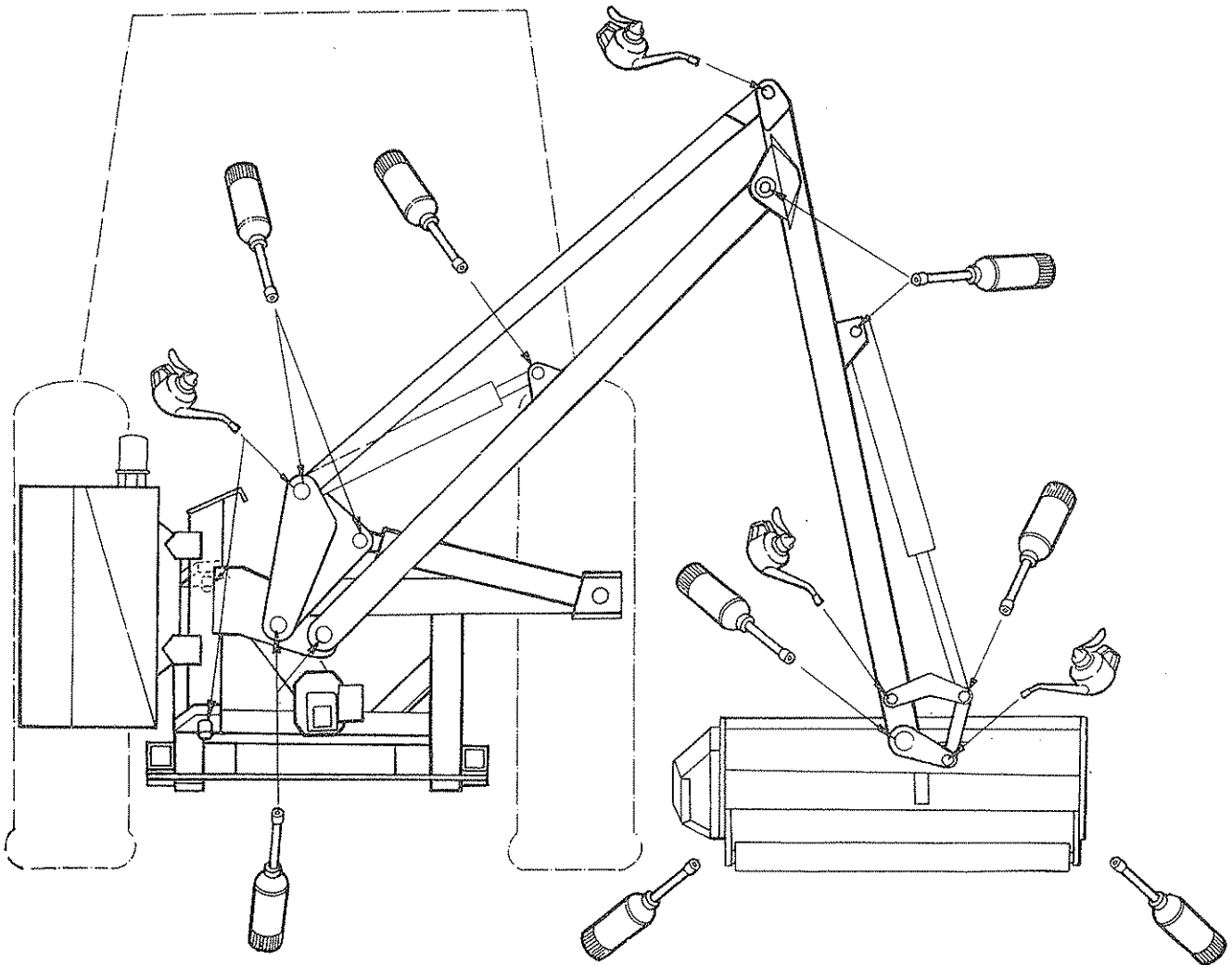
### MAINTENANCE

The Power Arm 24 has been designed to reduce servicing and maintenance to a minimum although any work specified in this section should be regularly and carefully carried out.

#### 1. Lubrication

##### a) General

Refer to the lubrication diagram below and grease daily all the points shown. Use an oil can once weekly where indicated at other pivot points.



**LUBRICATION DIAGRAM**

b) Power take-off shaft

The PTO shaft should be regularly examined to ensure that it is in good condition together with the guards. The universal joints should be greased very sparingly i.e. one shot daily.

Note: Overgreasing a universal joint will blow-out the cork or neoprene sealing rings that exclude the dirt from the needle bearings inside.

The two halves of the plastic guard should be checked daily to ensure that they can spin freely on the shaft. The nylon slip rings which support the guard on the drive shaft should be lightly greased at weekly intervals. Alternatively, the rings can be oiled daily through an access hole in the cover.

To gain access to the slip ring, rotate the white plastic slot-head fastener one half turn with a coin to separate the guard from the collar.

The telescopic drive shaft should be similarly separated and grease applied to the internal shaft at approximately 100 hour intervals.

c) Roller bushes

Do not attempt to oil or grease the roller bushes. They should be left dry. The case-hardened bearing surfaces of the roller brackets run within spring steel bushes. Any lubricant will attract dust and grit into the bearing surfaces and accelerate wear by a grinding paste action.

2. Hydraulic system

a) Oil supply

Check daily the oil level in the reservoir. The correct level can be seen as midway in the sight tube which is incorporated on the side of the reservoir.

No fixed time period can be quoted for oil changes as operating conditions and maintenance standards vary so widely. Although the oil does not wear out, it does eventually break down through contamination, oxidation and condensation. Continual operation of the machine beyond its rated capacity to almost the stall point of the rotor can cause overheating which produces insoluble gums, sludge, varnish and acids. Overheated oil tends to give a sluggish performance and causes earlier failure of seals and 'O' rings. Burnt and scorched oil odours and the oil darkening and thickening are all signs of oxidation and indicate the oil should be changed.

Moisture which results from condensation can become entrapped in the oil and cannot be removed by filtration so that contamination is a progressive factor.

Contamination can be reduced by :-

- i) Carrying out all hydraulic servicing in clean, dust-free surroundings.
- ii) Cleaning off around the reservoir cap before removal, and keeping that area clean.
- iii) Using clean containers when replenishing the system.
- iv) Regular servicing of the filtration system.

## b) Filtration maintenance

The machine is protected by a 125 micron suction strainer and a low pressure 10 micron full flow return line filter.

### i) Suction strainer

The strainer which is located on the lower end of the suction line within the reservoir should be removed and cleaned if any symptoms of pump cavitation, or spongy intermittent operation develops.

To service the strainer the complete suction line has to be withdrawn from the reservoir after releasing the bolts. The strainer is screwed onto the suction pipe. Remove and wash in clean diesel fuel and shake dry before re-installing. When re-assembling, the tank cover and its mating surface should be thoroughly cleaned off and re-jointed with a good quality non-hardening gasket compound.

### ii) Return line filter

The element should be changed at 500 hour intervals or earlier if indicated by the visual gauge mounted on the filter base. At normal operating temperature and speed the needle should remain in the green sector. If the needle enters the red sector it indicates that the filter is partially choked with dirt and should be changed.

Note: The needle will enter the red sector on starting up with cold oil but should drop back into the green as the oil warms up.

CAUTION: Continuing to operate the machine when the needle remains in the red sector will cause the filter by-pass valve to operate. This allows unfiltered oil to re-enter the system and cause contamination and rapid wear of the hydraulic components.

## 3. P.T.O. Gearbox

The gearbox is rigidly bolted into the main frame and has a sight/level plug. Oil level is correct when it is seen half-way up the plug. The gearbox oil should be changed every two years or at 1000 hour intervals; whichever occurs first. The capacity of the gearbox is 450 millilitres (3/4 pint). Use EP.90 gear oil.

## 4. Hydraulic pumps

No routine maintenance is necessary other than a periodical check for tightness of the mounting bolts and a visual check for oil leakage especially around the pump supply and pressure unions. Where two hose clips are used on the pump supply and return hoses, their worm drive barrels should be placed opposite each other at 180°.

Pump servicing is limited to replacing seals, gaskets and 'O' rings. Servicing should take place under clean dust-free conditions. Pumps should be thoroughly washed and their end plates and body lightly identified with scribe marks to ensure correct re-assembly.

When re-assembling, lubricate all components with clean oil and tighten down the securing bolts in a diagonal sequence to pull the pumps squarely together, finally tightening to a torque load of 4-5 Kgm (30-37 lbs/ft) M10 Setscrew  
2½-3 Kgm (18-22 lbs/ft) M8 Setscrew

The pump shaft nut should be torqued to 5.5 - 6 Kgm (40-45 lbs/ft)

Check for freedom of rotation. The pumps should turn freely under a hand load applied on a 6" radius arm. If tight, the lobe seals and/or backing washers have been trapped and the unit must be dismantled to rectify this.

After installation, the serviced pumps should be run for several minutes under a 'no load' condition before load is gradually applied. During this time frequent checks should be made of the pump casing temperature. An excessive temperature rise will indicate that the pump has been assembled incorrectly.

Generally it is unwise to replace major components since they have to be matched in sets. Unless this is done the pump will be inefficient, resulting in overheating and power loss. No detailed parts breakdown is shown, but factory reconditioned units are available within our service exchange scheme.

#### 5. Rotor control valve

No servicing is required of the rotor control valve other than a periodic check for oil leaks. The relief valve assembly within the block is calibrated by shims to give a setting of 193 - 207 Kg/cm<sup>2</sup> (2800 - 3000 psi). On no account should this pressure be exceeded.

The operating spool and block are selectively assembled and cannot be supplied as separate components.

The ports marked M.P. and M.R. designate Motor Pressure and Motor Return. Reversal of the hoses at these unions changes the direction of motor rotation.

#### 6. Hydraulic motor

Servicing of the hydraulic motor should be limited to replacing seals, gaskets and 'O' rings. Components of the motor are matched to close tolerances and are therefore not replaceable as individual parts.

The torque setting of the cap screws is 6 - 7 Kgm (40 - 47 lbs ft).

To remove the drive coupling from the shaft, use a tool of the sprocket puller type to remove it. Do not attempt to remove the coupling by hammering or leverage as this will damage the motor internally.

Any motor ordered as a service replacement will be supplied complete with the motor half of the drive coupling already installed.

#### Note :

Seal kit supplied under part no. 86 99 16<sup>A</sup> contains two shaft seals. Use the single lipped seal 86 29 141 with the special back-up washer 83 01 020 when servicing the motor. The double lipped seal 86 29 133 may be used when servicing the pump.

## 7. Hydraulic hoses

The condition of all hoses should be carefully checked during routine service of the machine. Hoses that have been chafed or damaged on their outer casing should be securely wrapped with waterproof adhesive tape to stop the metal braid from rusting. Hoses that have suffered damage to the metal braid should be changed at the earliest opportunity.

### Hose replacement

- a) Replace one hose at a time to avoid the risk of wrong connections.
- b) When the hose is screwed to an additional fitting or union, use a second spanner on the union to avoid breaking both seals.
- c) Do not use jointing compound on the threads.
- d) Avoid twisting the hose. Adjust the hose line to ensure freedom from rubbing or trapping before tightening hose end connections.

### Hose warranty

Warranty is limited to replacement of hoses which have failed due to faulty materials or manufacture. Warranty will not be considered on hoses that have suffered damage by abrasion, cuts or being pinched or trapped while in work. Neither will a claim be considered where a hose end has been damaged by a blow or where the threads or unions have been damaged by overtightening.

## 8. Hydraulic rams

### a) Ram seal replacement – general information.

- i) Whenever possible the ram should be removed from the machine and cleaned-off before dismantling on a clean work-bench.
- ii) When using a bench vice do not apply excessive pressure to the ram cylinder – use soft metal jaws when grasping the ram-rod.
- iii) Remove scores and nicks on the ram-rod by using a fine oil stone.  
Do not use a file or emery cloth.

### b) Reach and Angling rams

Unscrew gland nut and withdraw the complete rod assembly.  
Remove locking wire from groove of ram nut and unscrew nut.  
Remove piston, piston seals and gland housing assembly from rod.  
Renew all seals including the 'O' ring behind piston.  
Lubricate all seals on assembly and do not overtighten ram nut.  
The piston seals should be capable of being rotated.  
Tighten gland nut securely – if the gland nut has any tendency to become unscrewed, retighten and centre-pop the thread joint.

### c) Lift ram

This is a single-acting displacement type ram. To dismantle, grip the cylinder in a bench vice and rotate the gland retainer to expose the tail of the locking wire. Pry-up with a file tang or similar tool and counter rotate to wind the wire completely out of the groove.  
The gland retainer together with gland seal housing can now be withdrawn with the rod.

(See exploded parts diagram).



## 9. Cable control system

The cables operate on a push/pull system with the spool centring springs always returning the spool to the neutral position when the handle is released.

Care should be taken during installation and operation to ensure that the cables are not trapped or kinked. Any abrasion or damage to the outer casing should be sealed with plastic insulation tape to avoid moisture penetrating the cable.

No routine adjustment of the cables are necessary as they do not stretch. The threaded collar is correctly adjusted when the lever is in a vertical position in its housing allowing an equal amount of travel in either direction.

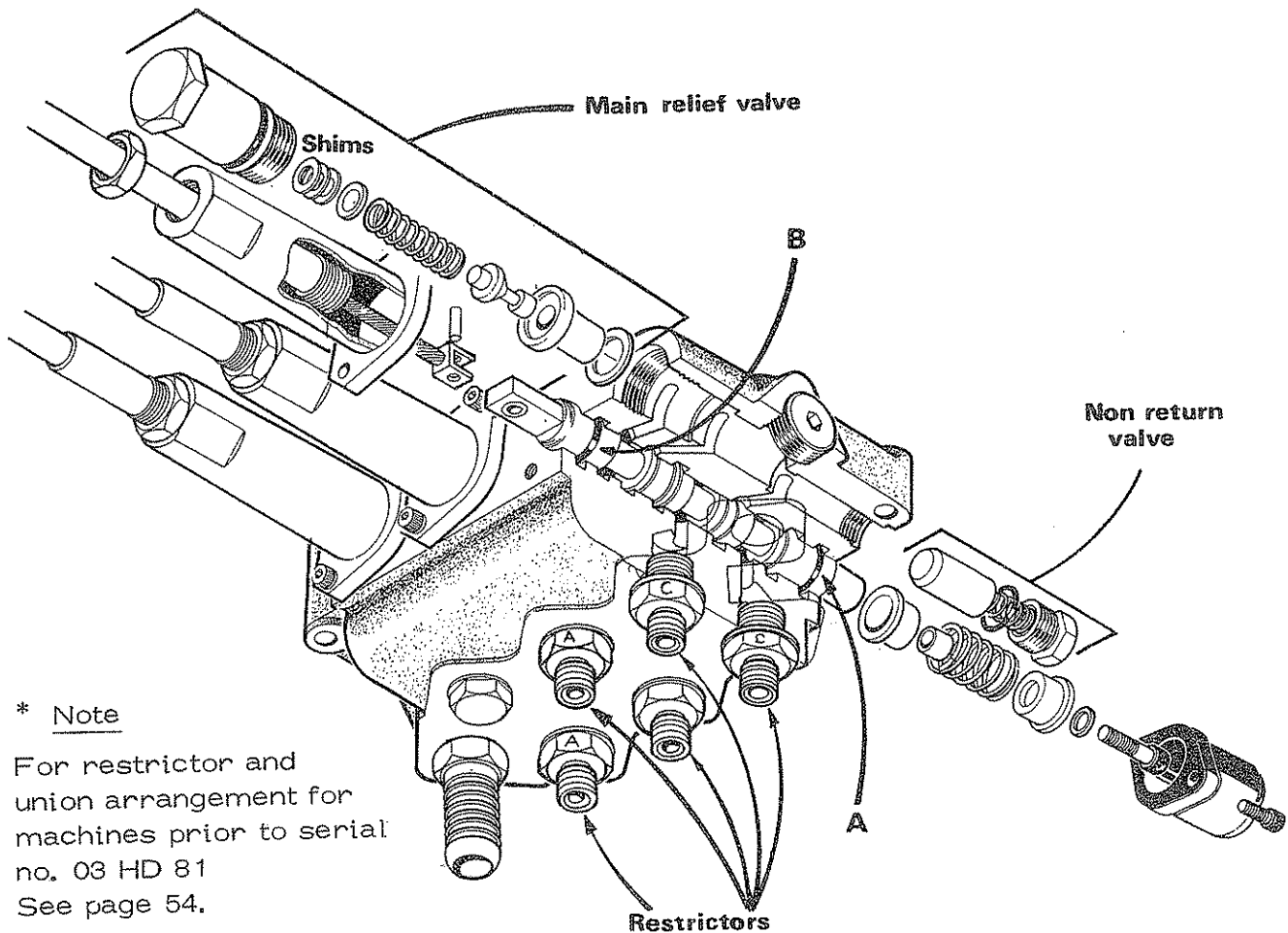
CAUTION: On no account should any attempt be made to lubricate the cables which are assembled with a special lubricant during manufacture.

## 10. Hydraulic control valve

### a) Replacing damaged or worn spool 'O' rings

- i) Release the locknut located on the cable at the back of the sleeve. Remove the two allen headed capscrews that secure the sleeve to the valve block and screw the sleeve back down the threaded portion of the cable to reveal the clevis pin which is then withdrawn from the end of the spool. Take care not to lose the roller in the eye of the spool end.
- ii) Remove the spring cover at the opposite end of the spool and remove the setscrew to release the return spring assembly.
- iii) Pull the spool through the block from the cable end until 'O' ring marked 'A' is accessible. Remove the 'O' ring from its groove using a smooth edged hook.
- iv) Completely remove the spool from the block out of the return spring end.
- v) Remove 'O' ring marked 'B' and refit a new 'O' ring.
- vi) Lightly oil the spool and replace it in the block from the return spring end pushing it through just far enough to clear 'O' ring groove at 'A'.
- vii) Fit new 'O' ring in groove 'A'.
- viii) Push the spool back through from the cable end far enough to re-assemble the return spring assembly and cover.
- ix) Replace the clevis pin in the spindle eye and re-assemble the sleeve. Adjustment of the threaded section being correct when the handle on the control box is in a vertical position. Re-tighten the locknut.

- Note:
1. Owing to the sharp edges in the design of the spool, failure to follow the above procedure could result in damage to the new 'O' rings resulting in external leakage.
  2. The spools are selectively assembled, matched with their mating bores in the block and should not be interchanged.



b) Relief valve

The relief valve setting is  $160 \text{ Kg/m}^2$  (2,300 psi).

A sticking relief valve will probably cause overheating and/or loss of power. If this is suspected it should be dismantled and examined for dirt and damage.

If any part of the valve is damaged a new relief valve assembly should be fitted. A pressure gauge in the supply circuit must be used to check the relief valve pressure which can be adjusted by adding or removing shims in the relief valve cap. Under no circumstances should shims be added without the use of a reliable pressure gauge otherwise serious damage to the tractor pump could result.

Use a new 'O' ring when refitting the relief valve.

c) Non-return valve

The non-return valve prevents the feed back of oil from the service ports to the pump. It is unlikely to need attention but if removed for cleaning a new 'O' ring should be fitted.

d) Restrictors

Restrictor unions which are identified by code letters are calibrated for correct speed of operation. The restricted hole should not be enlarged or the unions interchanged in the block.

## 11. Flail head

Frequently inspect the rotor assembly for damaged or missing flails. The bolts and nuts that secure the flail mounting bars to the rotor should be checked and kept tight. The flail shackles should be regularly inspected and any suspect ones replaced.

It has been found possible for the shackle eye to become lodged under the securing bolt head which in turn allows the flail to damage the bolt as it breaks back in work. Fitting a spacer (part no 71 14 081) on to the flail pin holds the shackle clear. Only the pins that carry the shackle adjacent to the bolt require the spacer.

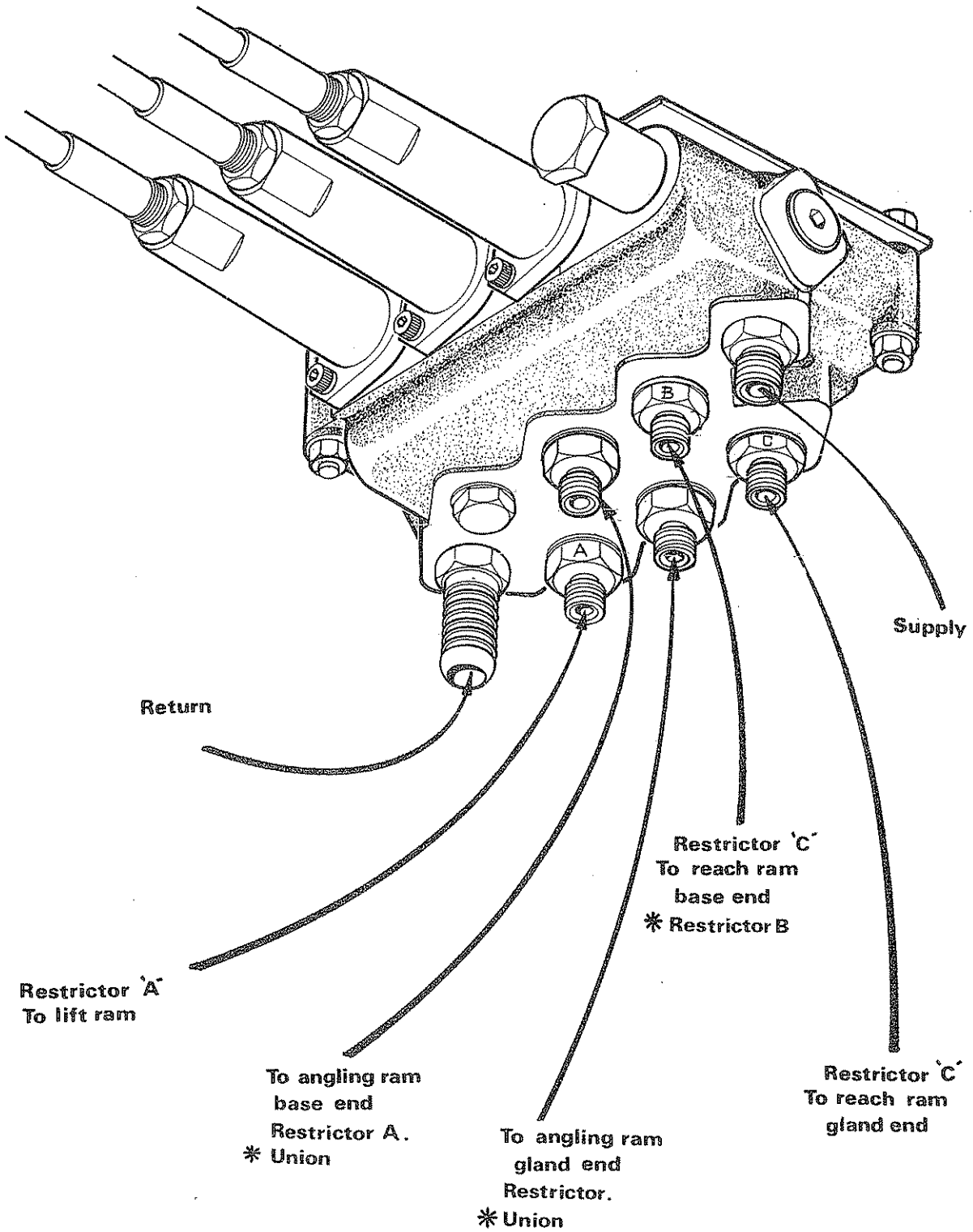
Do not attempt to run the rotor with flails missing. Im-balance will cause severe vibration and can rapidly damage the rotor shaft bearings. As an emergency measure if a flail is broken off or lost, remove another on the opposite side of the rotor to retain balance. Always replace flails in opposite pairs and never match up a new flail with a re-sharpened one which will of course be lighter.

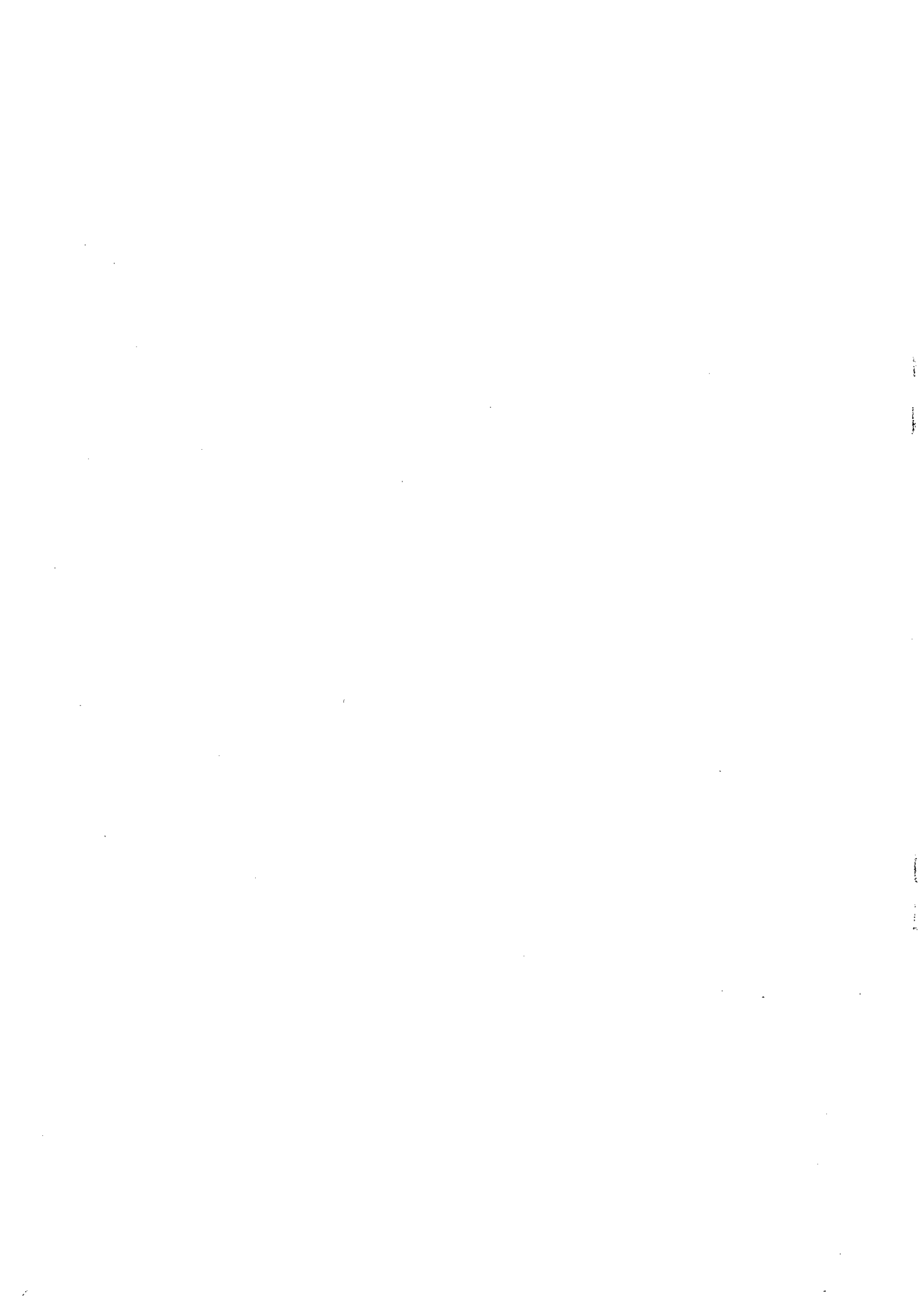
Blunt flails absorb a lot of power and leave an untidy finish to the work. They should be sharpened on a grindstone or with a portable grinder periodically.

Ensure that the bearing housings and hydraulic motor mounting nuts and bolts are kept tight. They should be checked during servicing.

# HOSE CONNECTIONS

\* Variations for machines prior to serial no. 03 HD 81





# SPARE PARTS MANUAL



## USE ONLY McCONNEL SPARE PARTS

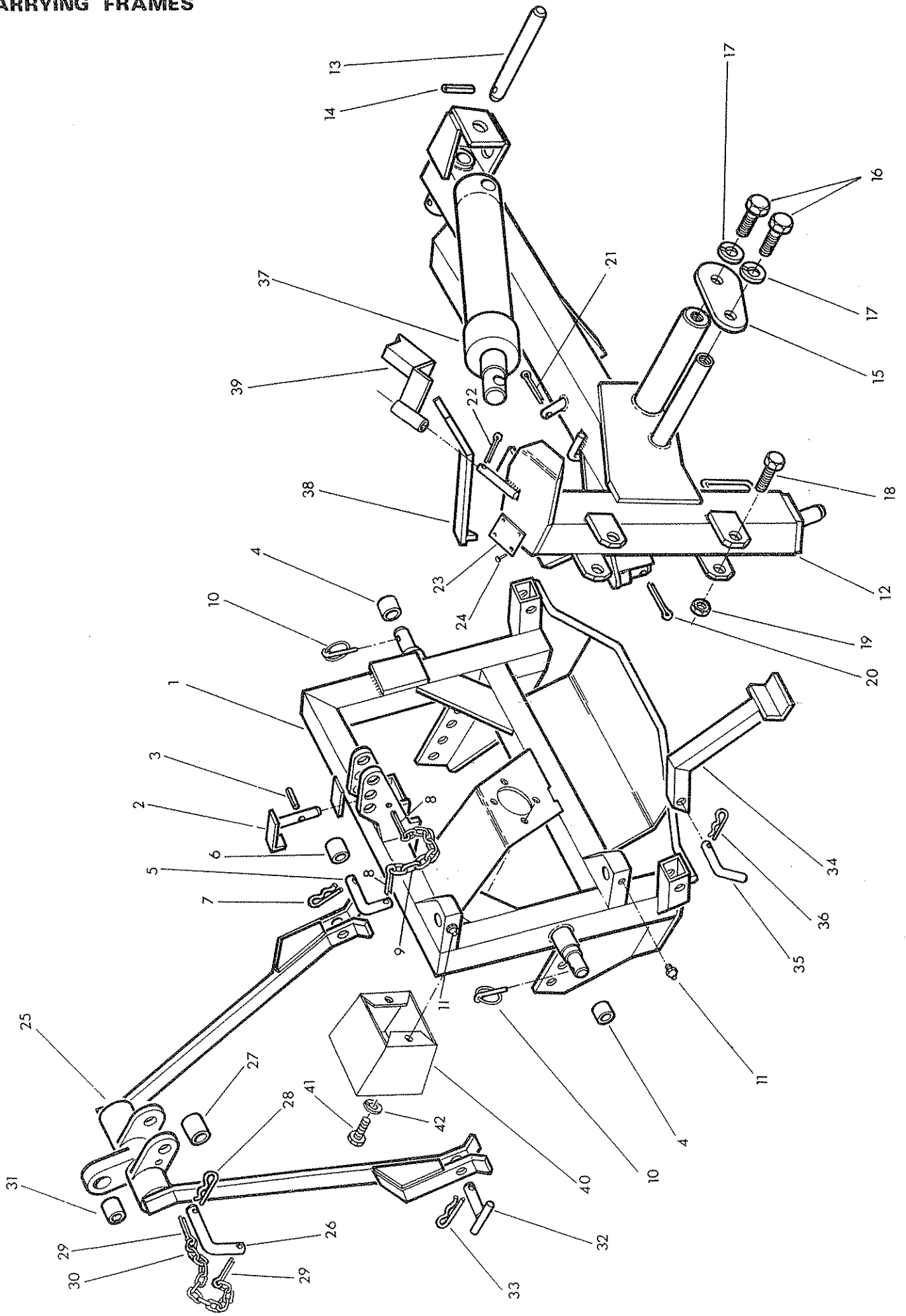
To be assured of the latest design improvements purchase your genuine replacements from the original equipment manufacturer F.W.McConnel Ltd. through your local dealer or stockist. Always quote machine type and serial number as well as the part number.

Design improvements may have altered some of the parts listed in this manual - the latest part will always be supplied when it is interchangeable with an earlier one.

### THE DOT SYSTEM

Many spares are supplied as Assemblies or as Sub-assemblies and, to help the customer determine the composition of an Assembly, the Dot System is used. The Main Assembly will not show a dot preceding its description and is printed in BLOCK CAPITALS. Subsequent listed parts are preceded by one or more dots until the next major assembly is reached. An increase in the number of preceding dots indicates that the item is an associated part of the preceding item. Whenever the number of dots are decreased by one this indicates the termination of an assembly.

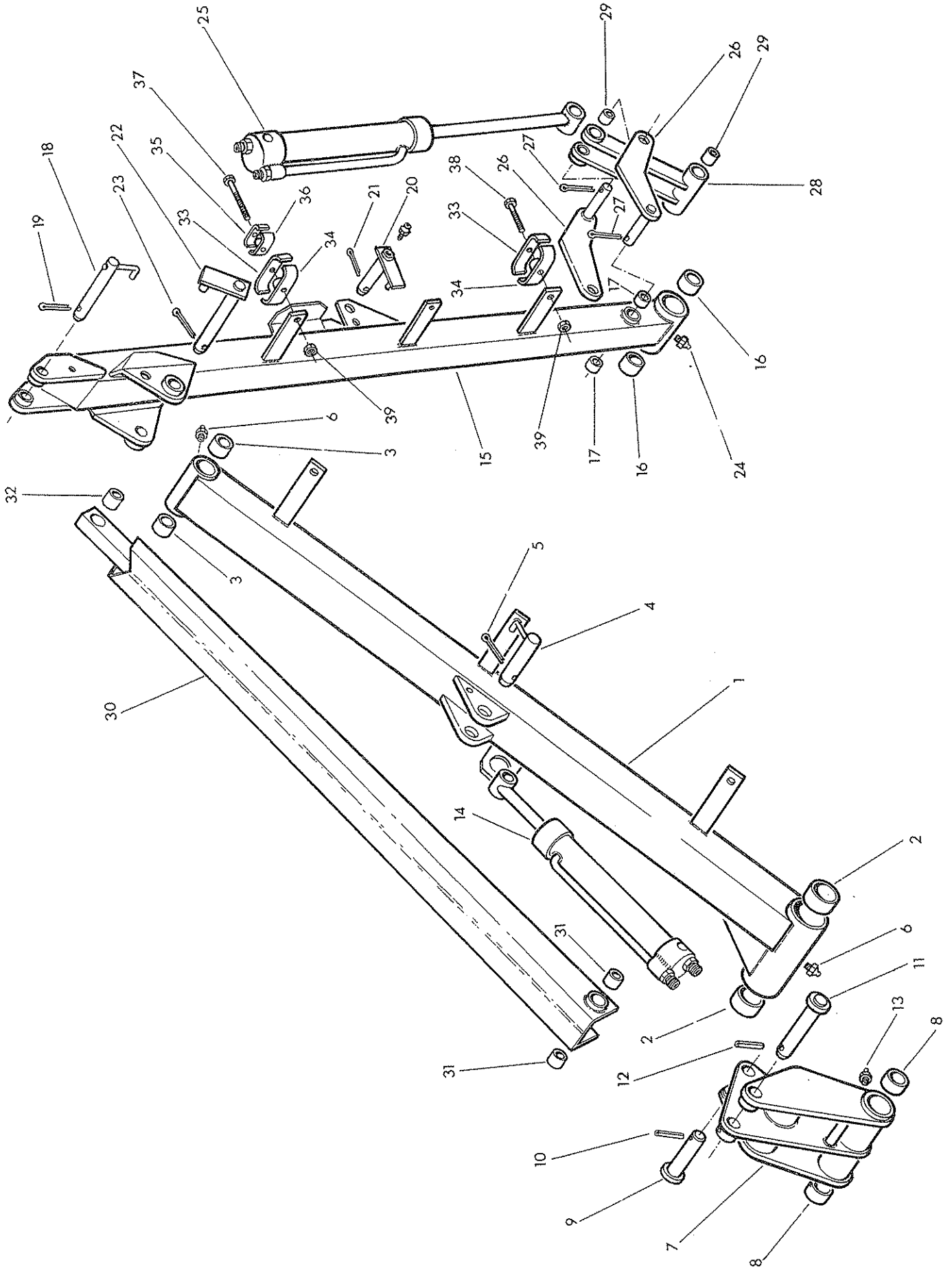
# CARRYING FRAMES



Ref	Part No.	Qty	Description
	71 14 250		PA24 FLAIL HEDGE CUTTER
1	71 14 266	1	.Initial frame c/w pins, sleeve and greaser
2	71 11 132	1	..Breakaway locking pin c/w spring dowel
3	04 25 630	1	...Spring dowel $\varnothing 6 \times 30$
4	14 67 096	2	..Linkage pin sleeve Cat.II
5	14 67 049	1	..Top link pin c/w chain sleeve etc.
6	14 67 063	1	...Sleeve
7	04 31 105	1	...Spring cotter
8	95 01 255	2	...Split pin $\varnothing 4 \times 25$
9	14 67 086	1	...Light chain 6" long
10	04 31 217	2	..Linch pin
11	09 01 125	2	..Greaser 1/8" BSP 45°
12	71 14 267	1	.Tee frame c/w pins, screws etc.
13	71 11 113	1	..Lift ram base pin c/w spring dowel
14	04 28 140	1	...Spring dowel $\varnothing 10 \times 40$
15	71 11 114	1	..Retaining plate
16	93 13 088	2	..Set screw M20 x 40
17	91 00 208	2	..Spring washer $\varnothing 20$
18	93 13 077	4	..Set screw M16 x
19	91 43 007	4	..Self locking nut M16
20	95 01 507	1	..Split pin $\varnothing 6 \times 50$
21	95 01 406	1	..Split pin $\varnothing 5 \times 40$
22	95 01 255	1	..Split pin $\varnothing 4 \times 25$
23	71 14 052	1	..Serial plate
24	71 03 230	4	..Pop rivet 1/8" diameter
25	71 11 259	1	.Stabilizer c/w pins etc.
26	14 67 049	1	..Top link pin c/w chain, sleeve etc.
27	14 67 063	1	...Sleeve
28	04 31 105	1	...Spring cotter
29	95 01 255	2	...Split pin $\varnothing 4 \times 25$
30	14 67 086	1	...Light chain 6" long
31	71 11 006	1	..Sleeve (Cat. I)
32	71 11 007	2	..Stabilizer pin c/w spring cotter
33	04 31 105	1	...Spring cotter
34	71 11 258	2	.Stand leg c/w pin
35	71 09 060	1	..Leg pin c/w spring cotter
36	04 31 105	1	...Spring cotter
37	71 11 282	1	.Lift ram assembly (see page 50)
38	71 11 116	1	.Breakaway strap
39	71 14 062	1	.Transport stop
40	71 14 268	1	.P.T.O. guard
41	93 13 046	4	.Set screw M12 x 20
42	91 00 206	4	.Spring washer $\varnothing 12$
	71 14 289	1	.Drive shaft assembly (not illustrated)



# ARMHEAD

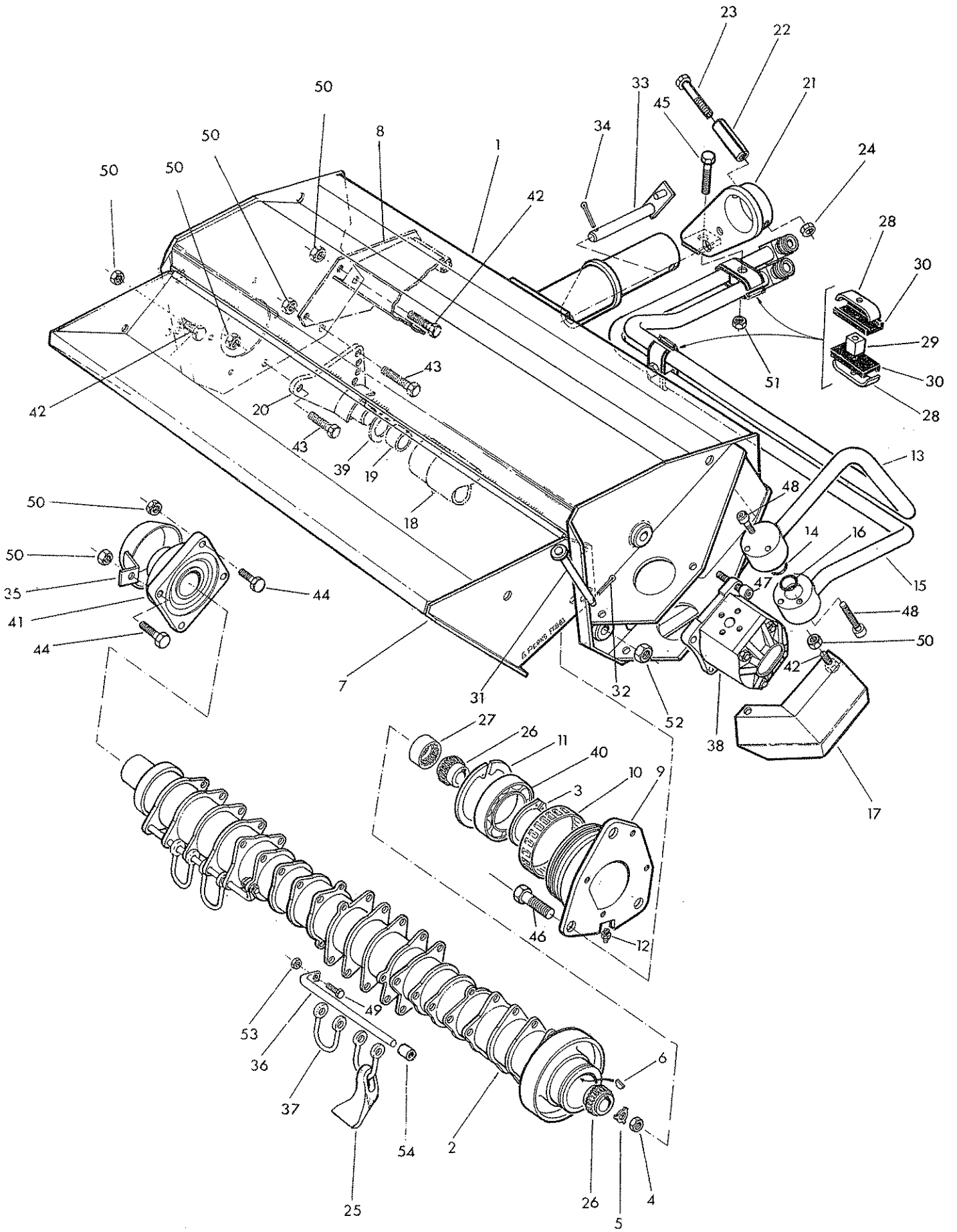


Ref	Part No.	Qty	Description
	71 14 250		PA24 FLAIL HEDGETRIMMER continued
1	71 14 264	1	.Main arm c/w bushes, pins etc.
2	60 00 161	2	..Bush
3	71 01 134	2	..Bush
4	71 09 062	1	..Reach ram rod end pin c/w split pin
5	05 03 126	1	...Split pin 1/4" diameter x 1½" long
6	09 01 121	2	..Greaser
7	71 11 265	1	.Rocker assy c/w bushes etc.
8	60 00 160	2	..Bush
9	71 11 069	1	..Lift ram rod end pin c/w spring dowel
10	04 28 140	1	...Spring dowel Ø10 x 40
11	71 11 068	1	..Reach ram base end pin c/w spring dowel
12	04 28 140	1	...Spring dowel Ø10 x 40
13	09 01 121	1	..Greaser 1/8" BSP St.
14	71 11 283	1	.Reach ram assembly (see page 51 )
15	71 14 265	1	.Dipper arm c/w bushes, pins etc.
16	71 11 175	2	..Bush
17	71 01 083	2	..Bush
18	71 14 039	1	..Link pin c/w split pin
19	95 01 406	1	...Split pin Ø5 x 40
20	71 14 080	1	..Angling ram base end pin c/w split pin
21	05 03 126	1	...Split pin 1/4" diameter x 1½" long
	09 01 121	1	.Greaser 1/8" BSP st
22	71 14 038	1	..Dipper arm pivot pin c/w split pin
23	05 03 166	1	...Split pin 1/4" diameter x 2" long
24	09 01 121	1	..Greaser 1/8" BSP St.
* 25	71 11 342	1	.Angling ram assembly (see page 52)
26	71 11 053	2	.Radius arm c/w split pin
27	95 01 406	1	..Split pin Ø5 x 40
28	71 11 054	1	.Slave link c/w bushes
29	71 01 083	4	..Bush
30	71 14 262	1	.Tension link c/w bushes
31	72 14 060	2	..Bush
32	71 01 083	1	..Bush
33	71 14 044	6	.Hose clip upper (large)
34	71 14 045	6	.Hose clip lower (large)
35	71 14 075	4	.Hose clip upper (small)
36	71 14 076	4	.Hose clip lower (small)
37	92 13 165	4	.Hexagon bolt M10 x 80
38	92 13 125	2	.Hexagon bolt M10 x 60
39	91 43 005	6	.Self locking nut M10

\* Angling ram prior to serial no. 03 HD 81 is:-

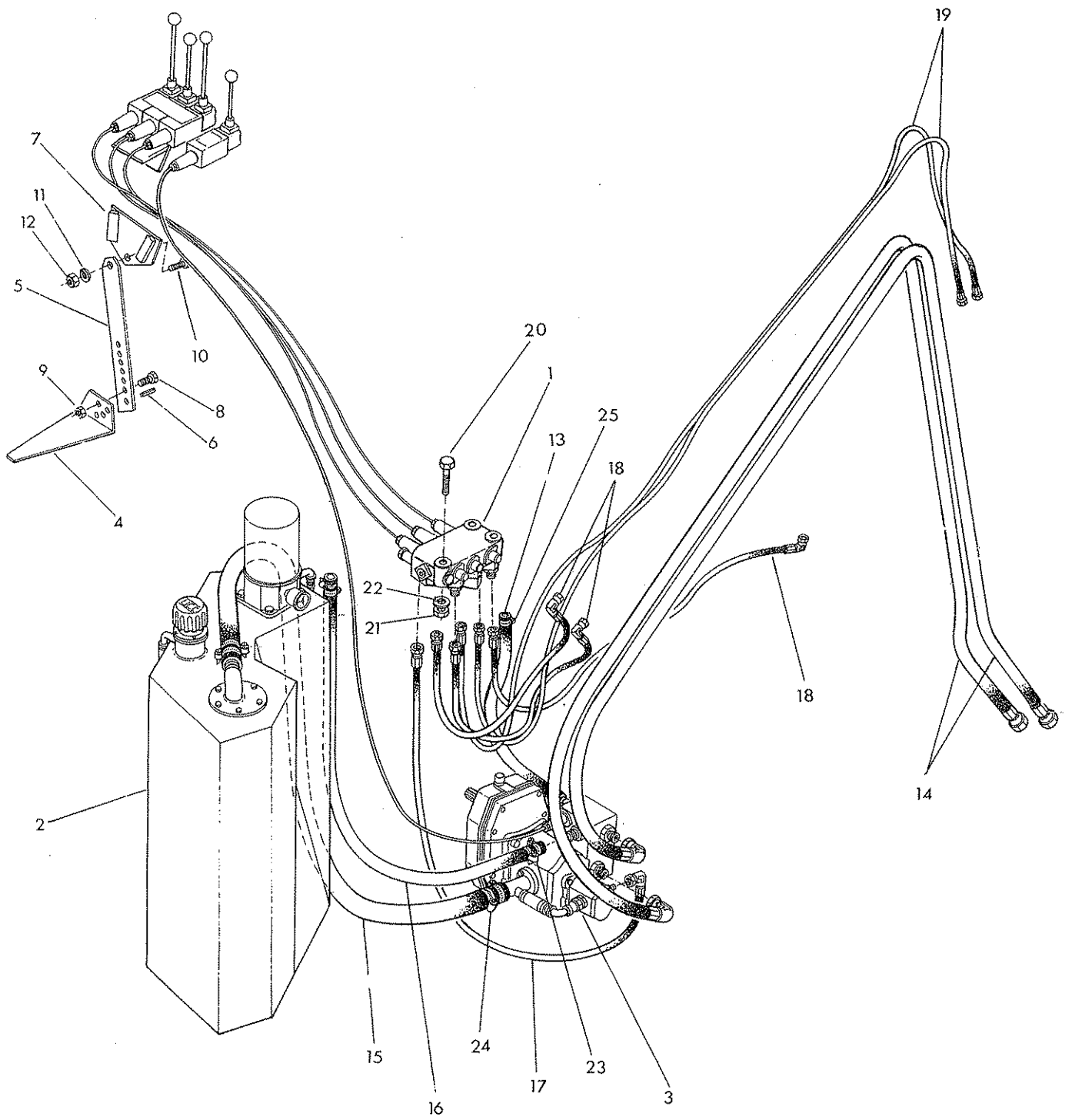
71 11 317	1	.Angling ram
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# FLAIL HEAD



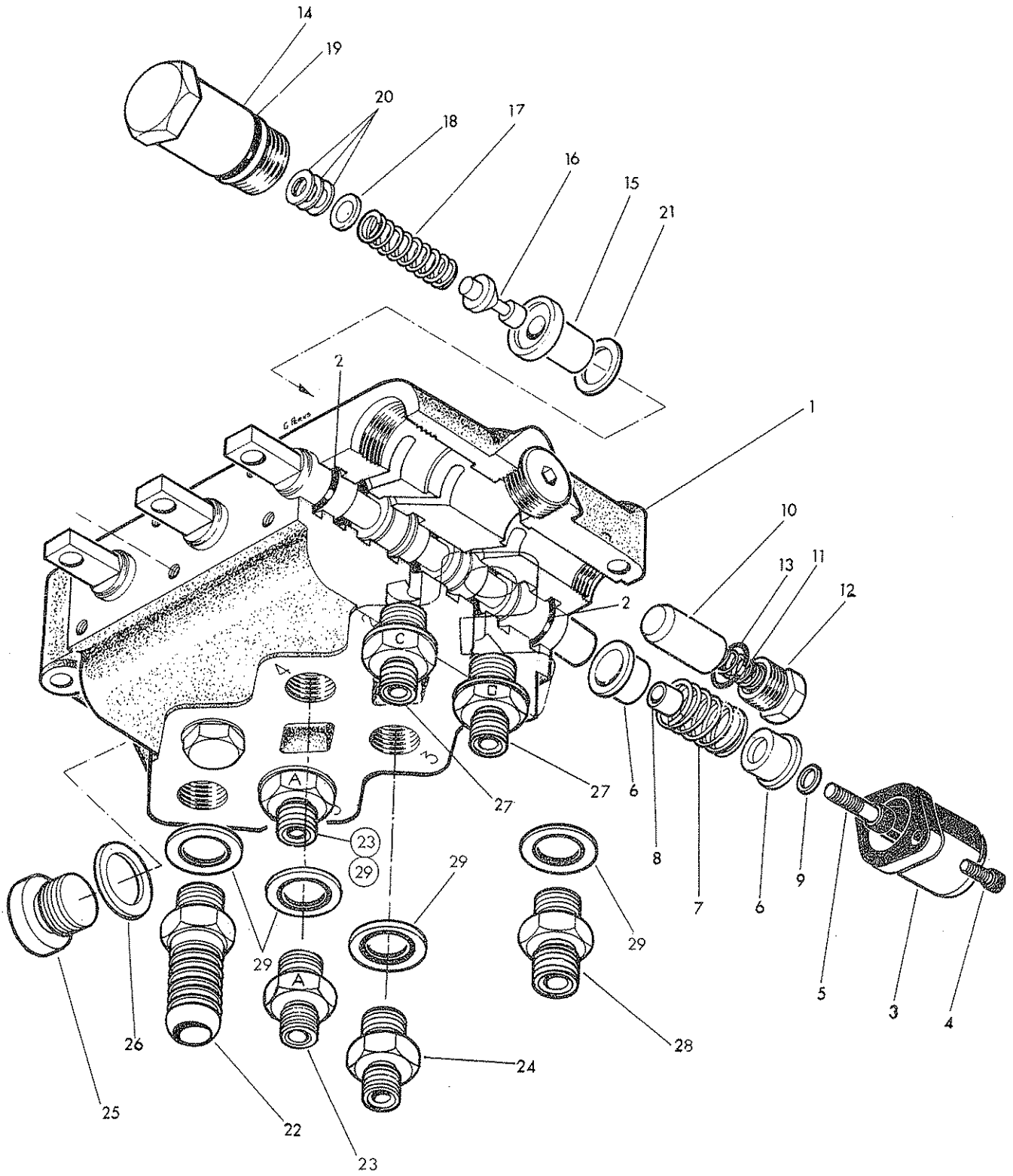
Ref	Part No.	Qty	Description
	71 14 255		PA24 FLAIL HEAD
1	71 14 291		.Flail casing
2	71 14 295	1	.Flail rotor c/w nut, washer, woodruff key & circlip
3	04 01 290	1	..External circlip $\varnothing$ 90
4	91 00 015	1	..Hexagon nut M14
5	82 01 139	1	..Tab washer $\varnothing$ 14
6	83 01 010	1	..Woodruff key
7	71 14 300	1	.Front hood
8	71 14 297	1	.Rear hood
9	71 14 298	1	.Bearing housing c/w tolerance ring, circlip & greaser
10	71 14 042	1	..Tolerance ring
11	71 14 043	1	..Internal circlip $\varnothing$ 140
12	09 01 125	1	..Greaser 1/8 BSP - 45°
13	71 14 303	1	.Rigid pipe upper c/w 'O' ring
14	86 00 121	1	..'O' ring
15	71 14 302	1	.Rigid pipe lower c/w 'O' ring
16	86 00 121	1	..'O' ring
17	71 14 299	1	.Motor cover
18	71 14 019	1	.Roller c/w bushes
19	72 13 023	2	..Bush
20	71 11 090	1	.Roller bracket right hand
	71 11 091	1	.Roller bracket left hand (not illustrated)
21	71 14 031	1	.Jaw plate c/w spring dowel bolt & nut
22	04 23 548		..Spring dowel 5/8" diameter x 3" long
23	92 13 185	1	..Bolt M10 x 90
24	91 43 005	1	..'Clevelok' nut M10
25	71 11 172	20	.Flail
	71 14 017	1	.Coupling assembly comprising :-
26	71 14 018	2	..Drive coupling half
27	71 14 016	1	..Coupling sleeve
28	71 14 046	4	.Rigid pipe clamp
29	71 14 048	2	.Pipe spacer
30	71 14 047	4	.Pipe clamp strip
31	71 14 049	1	.Motor cover mounting pin c/w split pin
32	05 03 095	1	..Split pin 3/16" diameter x 1.1/8" long
33	71 11 055	1	.Slave link pin c/w split pin
34	95 01 406	1	.Split pin $\varnothing$ 5 x 40
35	71 14 304	1	.Bearing cap
36	71 11 019	10	.Flail pin
37	73 14 183	20	.Flail shackle
38	83 01 260	1	.Hydraulic motor
39	60 01 136	2	.Thrust washer
40	06 00 043	1	.Bearing 6018
41	06 00 041	1	.Flange bearing
42	03 11 085	6	.Setscrew 1/2" UNF x 1" long
43	03 11 105	4	.Setscrew 1/2" UNF x 1.1/4" long
44	02 11 125	4	.Setscrew 1/2" UNF x 1/2" long
45	92 13 135	2	.Bolt M10 x 65
46	73 14 146	3	.Special bolt M16 x 50
47	93 00 104	4	.'Wedglok' cap screw M10 x 40
48	93 00 014	6	.'Wedglok' cap screw M10 x 60
49	03 11 103	10	.Setscrew 3/8" UNF x 1.1/4" long
50	01 41 005	14	.'Clevelok' 1/2" UNF
51	91 43 005	2	.'Clevelok' nut M10
52	91 00 001	3	.'Conelok' nut M16
53	01 41 003	10	.'Clevelok' nut 3/8" UNF
54	71 14 081	5	.Shackle spacer
	86 99 166		SEAL KIT Hydraulic motor

# HYDRAULIC INSTALLATION



Ref	Part No.	Qty	Description
	80 17 311		PA24 HYDRAULIC INSTALLATION
1	81 30 257	1	.Control assembly (see pages 38 & 40)
2	71 14 270	1	.Hydraulic oil tank (see page 42)
3	80 13 343	1	.Gearbox/pump/rotor control valve assembly (see page 44)
	71 09 319	1	.Universal socket and pillar comprising :-
4	71 09 320	1	..Sandwich plate
5	71 09 146	1	..Pillar c/w spring dowel
6	04 22 816	1	...Spring dowel
7	71 09 147	1	..Socket
8	93 13 066	1	..Setscrew M12 x 30
9	91 13 006	1	..Hexagon nut M12
10	03 11 086	1	..Setscrew 5/8" UNF x 1" long
11	01 00 206	1	..Spring washer 5/8" diameter
12	01 11 006	1	..Hexagon nut 5/8" UNF
13	85 01 106	1	.Hose 5/8" bore x 27" long
14	85 01 104	2	.Hose 3/4" BSP St - F 90° F x 184" long
15	85 01 105	1	.Hose 1¼" bore x 59" long
16	85 00 842	1	.Hose 1" bore x 42" long
17	85 31 303	1	.Hose 3/8" BSP St - F 90° - F x 42" long
18	85 35 022	3	.Hose 1/4" BSP St - F 90° - F x 46" long
19	85 35 032	2	.Hose 1/4" BSP St - F 90° - F x 153" long
20	92 13 124	3	.Bolt M8 x 60
21	91 13 004	3	.Hexagon nut M8
22	91 00 204	3	.Spring washer Ø8
23	09 04 106	4	.Hose clip (1" bore hose)
24	09 04 108	4	.Hose clip (1¼" bore hose)
25	09 04 204	2	.Hose clip (5/8" bore hose)

# CONTROL VALVE



Ref	Part No.	Qty	Description
	81 30 257		HYDRAULIC CONTROL ASSEMBLY
	81 30 256	1	..Valve c/w connections
1	81 30 252	1	..Valve block c/w spools 'O' rings
2	86 00 112	6	...'O' ring
3	81 30 002	3	..Centring spring cover
4	93 43 022	6	..Socket headed capscrew M5 x 12
5	93 83 043	3	..Set screw M6 x 20
6	81 30 003	6	..Centring spring cup
7	81 30 004	3	..Centring spring
8	81 30 005	3	..Distance piece
9	81 30 020	3	..Washer
	81 30 022	1	..non-return valve assembly comprising:-
10	81 30 006	1	...Supply check valve
11	81 30 007	1	...Spring
12	81 30 008	1	...Plug
13	86 00 501	1	...'O' ring
	81 30 023	1	..Relief valve assembly
14	81 30 045	1	...Relief valve body
15	81 30 016	1	...Relief valve seat housing
16	81 30 015	1	...Relief valve needle
17	81 30 011	1	...Relief valve spring
18	81 30 044	1	...Washer
19	86 00 113	1	...'O' ring
20	81 30 043	as reqd	...Shim
21	81 30 017	1	...Sealing washer
22	81 25 008	1	..Return connection 5/8" bore
23	81 30 046	2	..Restrictor union 'A' ¼ BSP — 3/8 BSP
24	85 81 145	1	..Restrictor Union 3/8" BSP — ¼" BSP M — M
25	81 30 061	1	..Cap
26	81 30 064	1	...Copper sealing washer
27	81 30 048	2	..Restrictor union 'C' ¼ BSP — 3/8" BSP
28	60 00 113	1	..Union 3/8" BSP M — M
29	86 50 103	8	..Bonded seal 3/8" BSP
	86 99 163		SEAL KIT

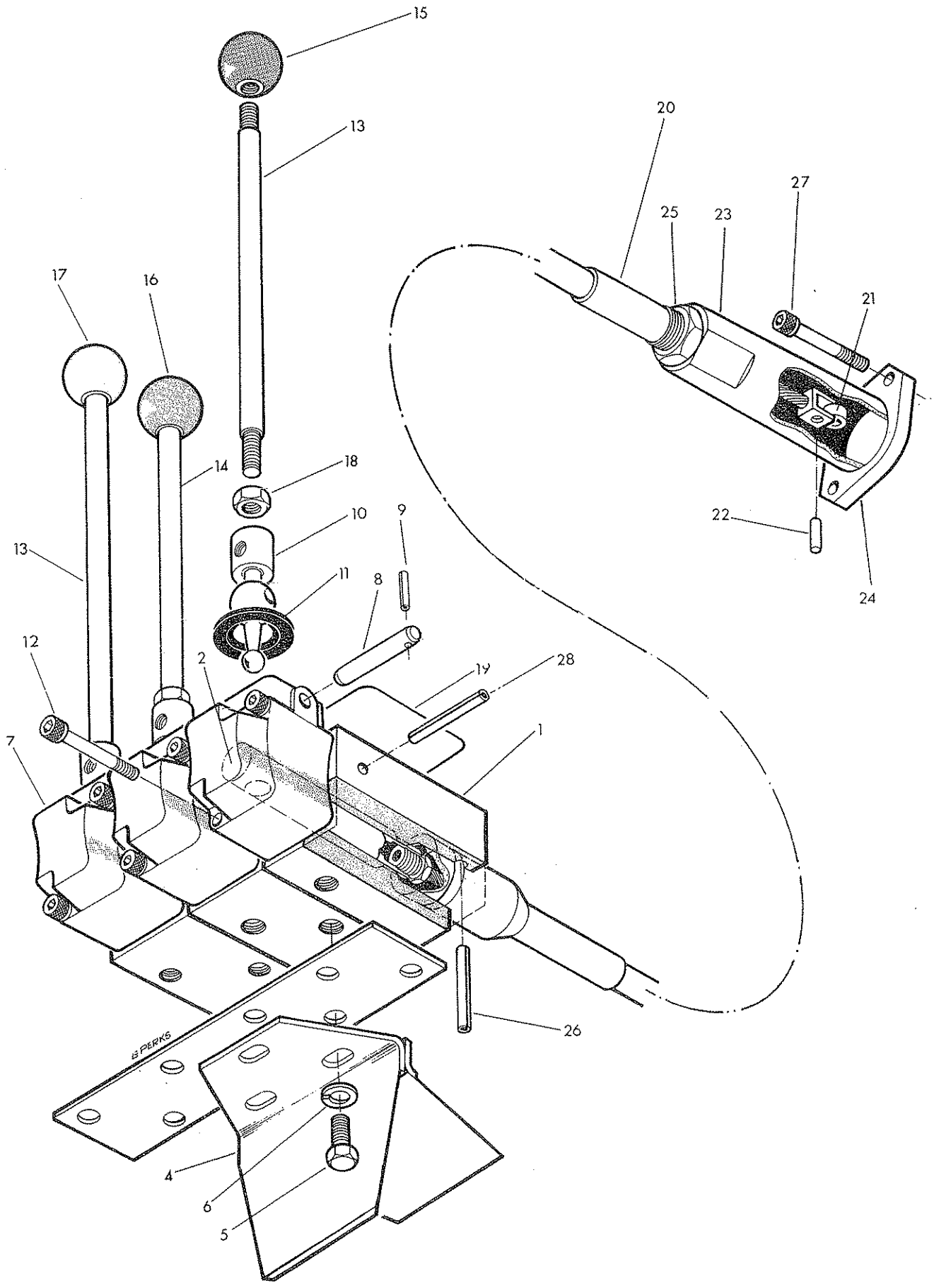
\* Spares Note

Should the whole control unit part no. 81 30 257 be required as a spare for machines prior to serial no. 03 HD 81 two extra unions part no. 85 81 145 are required. These replace the shuttle block on the breakaway ram.

\* Valve assembly for machines prior to Serial No. 03 HD 81 see page 54.

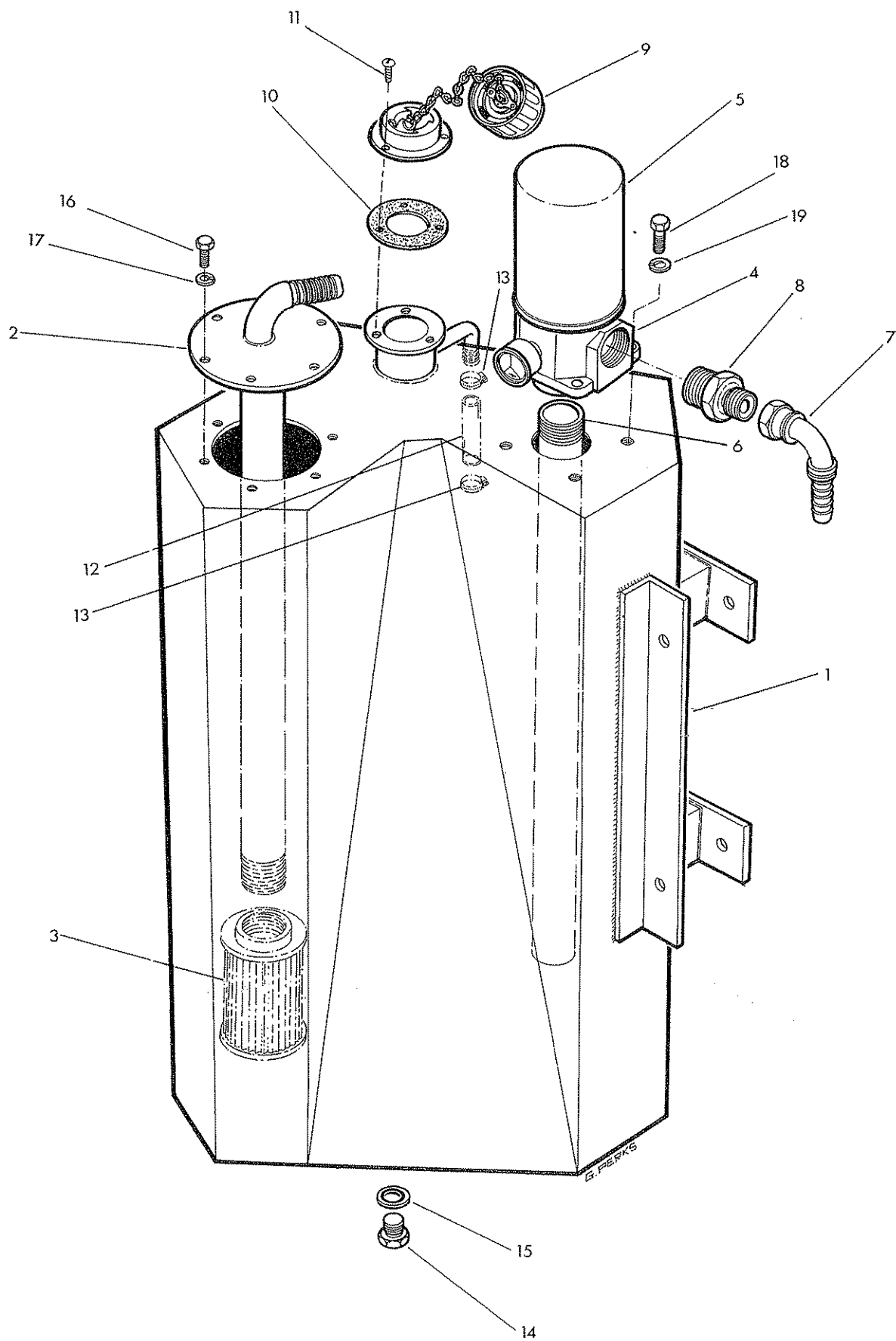


# LEVERS & CABLES



Ref	Part No.	Qty	Description
	81 30 257		HYDRAULIC CONTROL ASSEMBLY (continued)
1	81 30 052	3	.Control block
2	81 30 053	3	.Control block spindle
3	71 14 071	1	.Control block mounting base
4	80 17 301	1	.Wedge plate
5	93 13 034	6	.Setscrew M8 x 16
6	01 00 102	6	.Thin washer 5/16" diameter
	81 30 065	3	.Lever pivot box assembly comprising :-
7	81 30 001	1	..Lever pivot box
8	81 30 009	1	..Lever pivot spindle
9	81 30 021	1	..Spring dowel
10	81 30 019	1	..Lever
11	81 30 013	1	..Lever seal ring
12	92 43 072	6	.Socket headed capscrew M5 x 35
13	71 09 131	2	.Lever handle long
14	71 09 132	1	.Lever handle short
15	09 03 112	1	.Lever knob - Reach (Red)
16	09 03 113	1	.Lever knob - Angle (Green)
17	09 03 114	1	.Lever knob - Lift (Yellow)
18	91 13 004	3	.Hexagon nut M8
19	81 19 010	1	.Operating instruction label
20	80 17 003	3	.Cable c/w spacer and pin, sleeve, flange, etc.
21	80 17 004	1	..Spacer
22	80 17 005	1	..Pin
23	81 25 049	1	..Sleeve
24	81 25 050	1	..Flange
25	91 00 016	1	..Thin locknut $\varnothing 16 \times 1.5$ pitch
26	04 25 522	3	.Spring dowel $\varnothing 5 \times 22$
27	93 43 032	6	.Socket headed capscrew M5 x 16
28	04 25 540	3	.Spring dowel $\varnothing 5 \times 40$

# OIL TANK

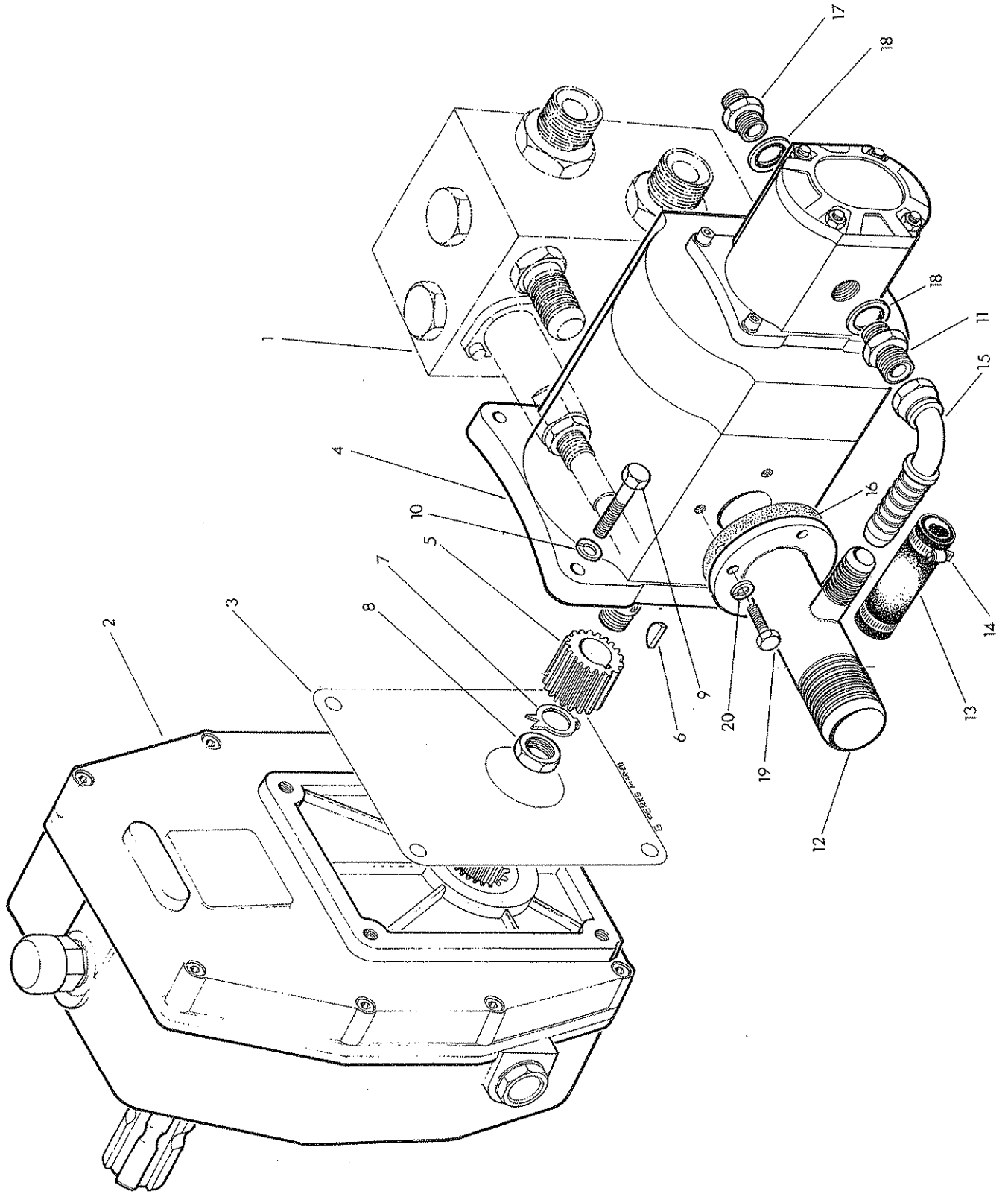


Ref	Part No.	Qty	Description
	71 14 270		HYDRAULIC OIL TANK ASSEMBLY
* 1	71 14 271	1	.Oil tank
	71 14 272	1	..Suction element assembly comprising :-
2	71 14 281	1	..Suction pipe
3	84 01 042	1	..Suction filter element
	71 14 001	1	..Top filter assembly comprising :-
4	84 01 040	1	..Filter c/w element
5	84 01 041	1	...Canister filter element
6	71 14 002	1	..Pipe
7	71 14 005	1	..90° Elbow connection 1" BSP-F.
☐ 8	71 14 006	1	..Union 1.1/2" BSP - 1" BSP M-M
	84 01 014	1	..Filler - breather assembly comprising :-
9	84 01 015	1	..Filler cap and neck
10	84 01 017	1	..Gasket
11	03 00 082	3	..Screw - self tapping - 3/16" dia. x 1/2" long
12	85 05 006	1	..Oil sight tube
13	09 04 204	2	..Hose clip
14	60 01 124	1	..Drain plug
15	86 50 104	1	..Bonded seal
16	93 13 023	6	..Setscrew M6 x 12
17	91 00 203	6	..Spring washer Ø6
18	93 13 054	4	..Setscrew M8 x 25
19	91 00 204	4	..Spring washer

\* Joint between the suction element assembly and oil-tank should be sealed with 'Hermetite' liquid gasket or a similar silicone sealing compound.

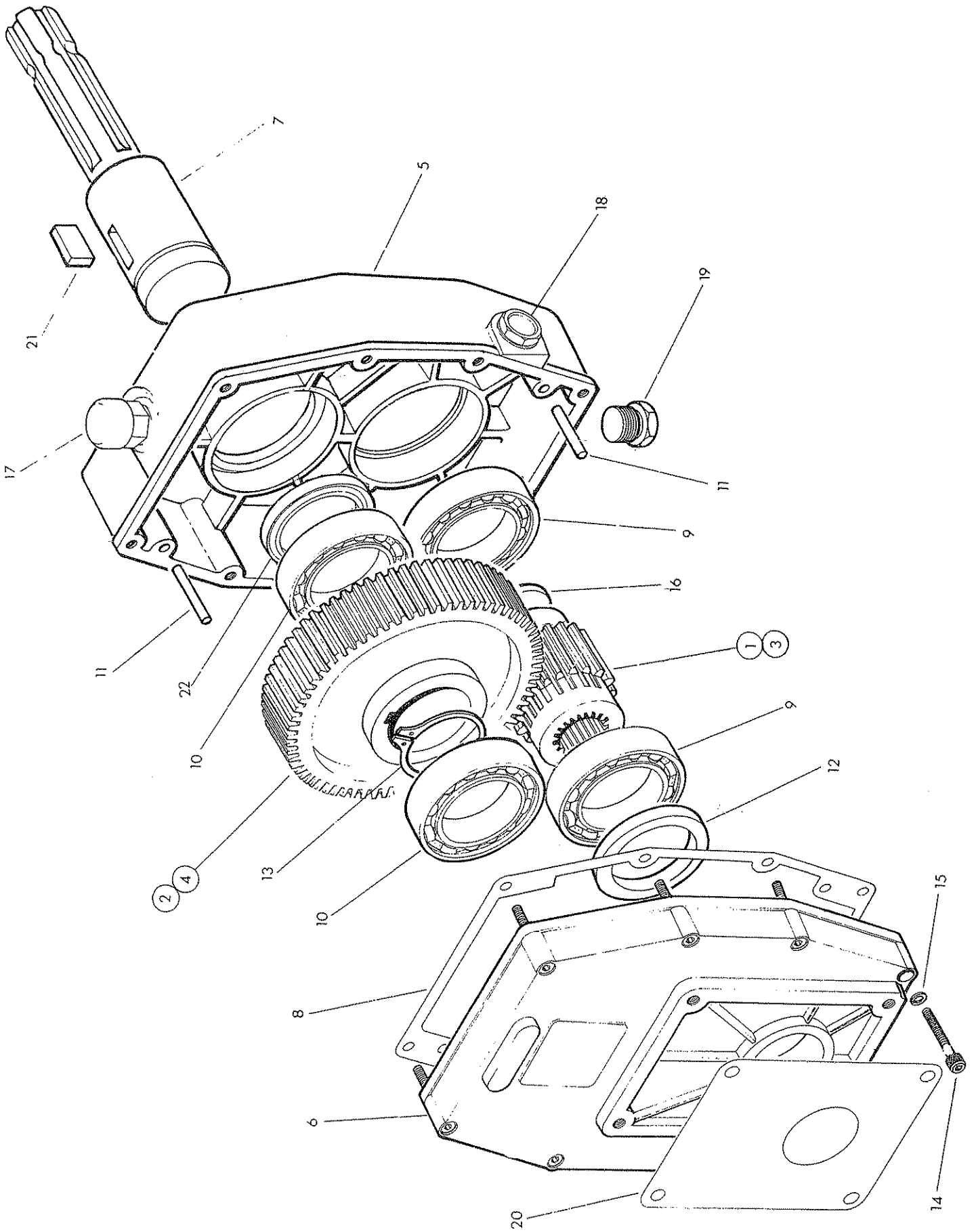
☐ Assemble item 8 using P.T.F.E. jointing tape

# GEARBOX-PUMP-ROTOR CONTROL VALVE



Ref	Part No.	Qty	Description
	80 13 343		GEARBOX/PUMP/ROTOR CONTROL VALVE ASSY
1	81 25 315	1	.Rotor control valve (see page 48)
	80 13 341	1	.Gearbox pump assembly
2	80 13 339	1	..Gearbox assembly (see page 46)
3	80 13 056	1	...Pump face gasket - ref. only
4	82 01 458	1	..Combination pump c/w key washer, nut & coupling
5	80 13 057	1	...Pump drive coupling
6	83 01 010	1	...Woodruff key
7	82 01 139	1	...Tab washer
8	91 00 015	1	...Thin hexagon nut
9	92 13 095	4	..Hexagon bolt M10 x 45
10	91 00 205	4	..Spring washer Ø10
11	85 81 175	1	.Union 3/8" BSP - 5/8" BSP M - M
12	71 14 308	1	.Junction union
13	85 01 103	1	.Hose 5/8" bore 2½" long
14	09 04 204	2	.Hose clip (5/8" bore hose)
15	85 81 173	1	.Swept elbow connection
16	80 13 023	1	.Gasket
17	60 00 113	1	.Union 3/8" BSP M - M
18	86 50 103	2	.Bonded seal 3/8" BSP
19	93 13 044	3	.Setscrew M8 x 20
20	91 00 204	3	.Spring washer Ø8
	86 99 181		<u>Seal kit</u> hydraulic pump
	86 29 133		.Shaft seal (not illus.)

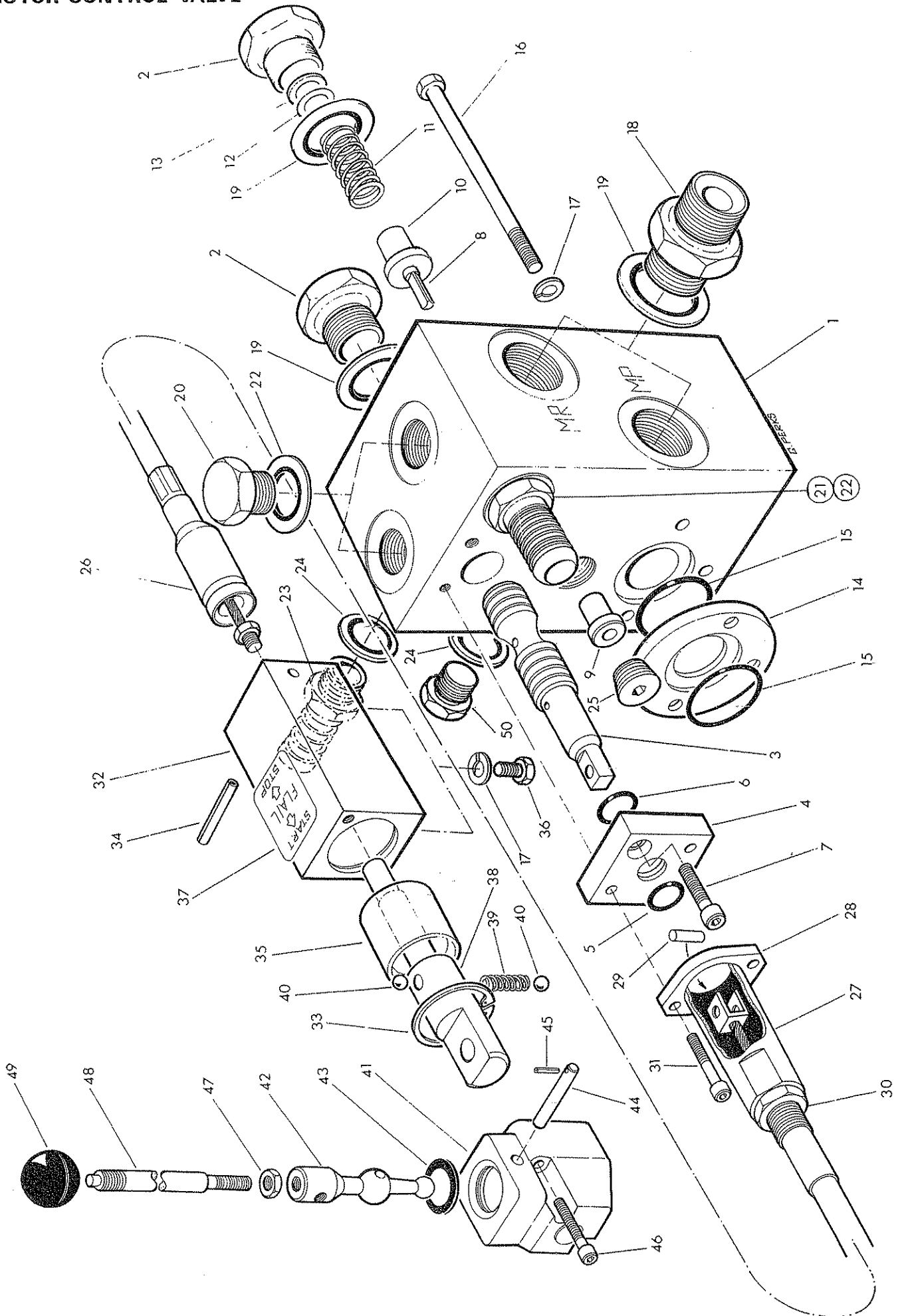
# GEARBOX



Ref	Part No.	Qty Home Market	Qty Export Market	Description
	80 13 339	1		GEARBOX ASSEMBLY BREVINI M.P3
	80 13 340		1	GEARBOX ASSEMBLY BREVINI MP3
1	80 13 060	1		.Pinion
2	80 13 062	1		.Gear
3	80 13 059		1	.Pinion
4	80 13 061		1	.Gear
5	80 13 063	1	1	.Gearbox case
6	80 13 064	1	1	.Gearbox lid
7	80 13 065	1	1	.Male stub shaft
8	80 13 058	1	1	.Gearbox case sealing gasket
9	06 00 047	2	2	.Bearing 6009
10	06 00 048	2	2	.Bearing 6010
11	80 13 066	2	2	.Dowel $\varnothing 5 \times 29,8$
12	86 29 139	1	1	.Seal
13	04 01 250	1	1	.External circlip $\varnothing 50$
14	93 43 064	8	8	.Socket headed cap screw M8x30
15	91 00 204	8	8	.Spring washer $\varnothing 8$
16	80 13 067	1	1	.Expansion plug
17	80 13 068	1	1	.Breather plug
18	80 13 069	1	1	.Oil level plug
19	80 13 070	1	1	.Drain plug
20	90 13 056	1	1	.Pump face gasket
21	80 13 071	1	1	.Key 12x8x30
22	86 29 134	1	1	.Seal

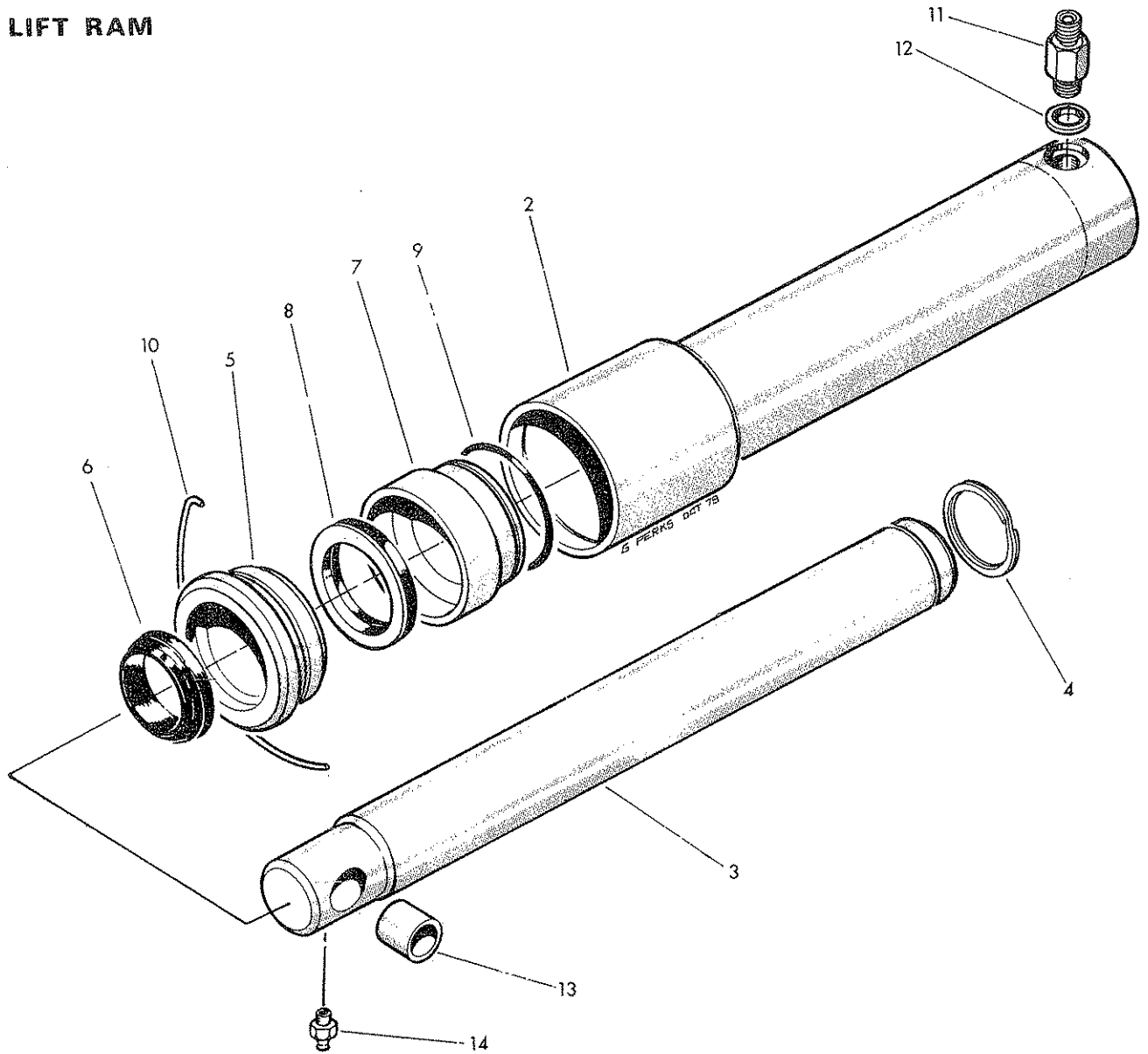


# ROTOR CONTROL VALVE



Ref	Part No.	Qty	Description
	81 25 315		ROTOR CONTROL VALVE
1	81 25 316	1	.Valve body
2	81 25 031	2	.Spool or Relief Valve Cap
3	81 25 038	1	.Spool
4	81 25 039	1	.Control plate c/w 'O' rings
5	86 00 502	1	.. 'O' ring
6	86 00 503	1	.. 'O' ring
7	93 43 023	2	.Capscrew M6 x 12
8	81 25 042	1	.Relief valve needle
9	81 25 048	1	.Drill bush $\varnothing 5$
10	81 25 047	1	.Spring register
11	81 10 003	1	.Relief valve spring
12	60 01 232	As req'd	.0.4 Shim washer
13	01 00 102	" "	.5/16" dia. bright washer
14	81 25 045	1	.Spacer
15	86 00 119	2	. 'O' ring
16	92 13 184	3	.Bolt M8 x 90
17	91 00 204	5	.Spring washer $\varnothing 8$
18	85 81 136	2	.Union 3/4" BSP M-M
19	86 50 106	4	.Bonded seal 3/4" BSP
20	81 03 001	2	.Blank 1/2" BSP
21	81 27 059	1	.Return connection
22	86 50 104	3	.Bonded seal 1/2" BSP
23	81 25 008	1	.Low pressure connection
24	86 50 103	2	.Bonded seal 3/8" BSP
25	85 82 043	1	.Taper plug 3/8" BSPT
26	81 25 046	1	.Cable assembly c/w sleeve, flange etc.
27	81 25 049	1	.. Sleeve
28	81 25 050	1	.. Flange
29	81 25 051	1	.. Pin
30	91 00 016	1	.. Thin locknut $\varnothing 16 \times 1.5$ pitch
31	93 43 022	2	.Capscrew M5 x 12
32	71 14 069	1	.Control block c/w spring dowel and circlip
33	04 11 118	1	.. Internal circlip
34	04 25 540	1	.. Spring dowel $\varnothing 5 \times 40$
35	71 14 067	1	.Detent cage
36	93 13 034	2	.Setscrew M8 x 16
37	71 14 073	1	.Instruction label
38	71 14 070	1	.Spindle
39	71 14 068	1	.Spring
40	09 05 108	2	.Steel ball 1/4" diameter
	81 30 065	1	.Lever pivot box assembly comprising :-
41	81 30 001	1	.. Lever pivot box
42	81 30 019	1	.. Lever
43	81 30 013	1	.. Lever seal ring
44	81 30 009	1	.. Lever pivot
45	81 30 021	1	.. Spring dowel
46	93 43 072	2	.Capscrew M5 x 35
47	91 13 004	1	.Thin hexagon nut M8
48	71 14 072	1	.Lever handle
49	09 03 121	1	.Knob - black
50	80 03 001	1	.Plug 3/8" BSP

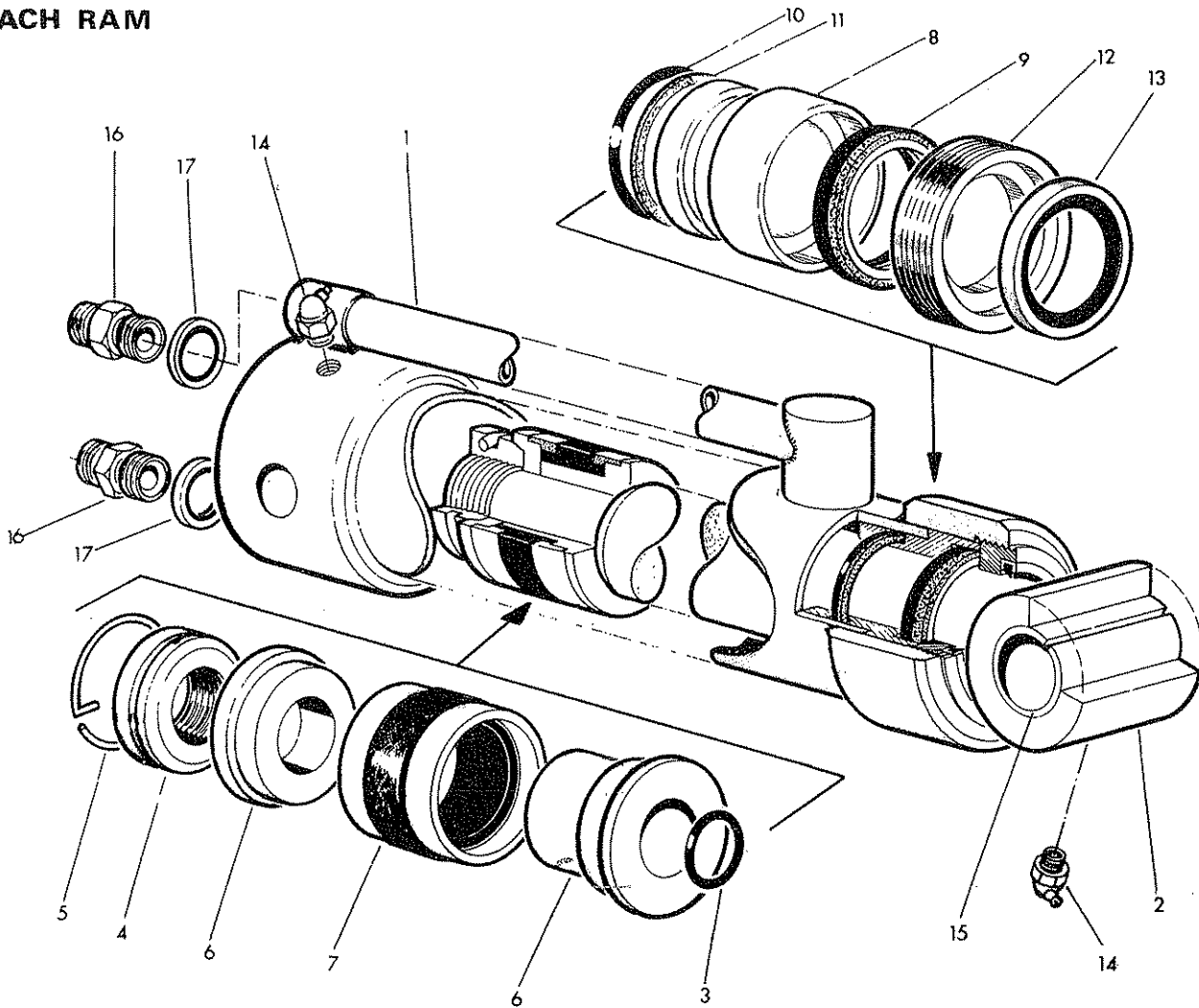
# LIFT RAM



Ref	Part No.	Qty	Description
	71 11 282	1	LIFT RAM ASSEMBLY complete
	71 09 264	1	.Lift ram comprising :-
2	71 09 265	1	..Ram barrel
3	71 09 266	1	..Ram rod c/w spirolox
4	04 03 260	1	...Spirolox ring
5	71 09 032	1	..Gland retainer c/w wiper
6	86 29 130	1	...Wiper ring
7	71 09 033	1	..Gland housing c/w seals
8	86 15 001	1	...Seal
9	86 00 312	1	... 'O' ring
10	71 09 034	1	..Locking wire
11	85 81 146	1	.Union 3/8" BSP - 1/4" BSP M-M
12	86 50 103	1	.Bonded seal 3/8" BSP
13	71 05 050	1	.Bush
14	09 01 121	1	.Greaser 1/8" BSP

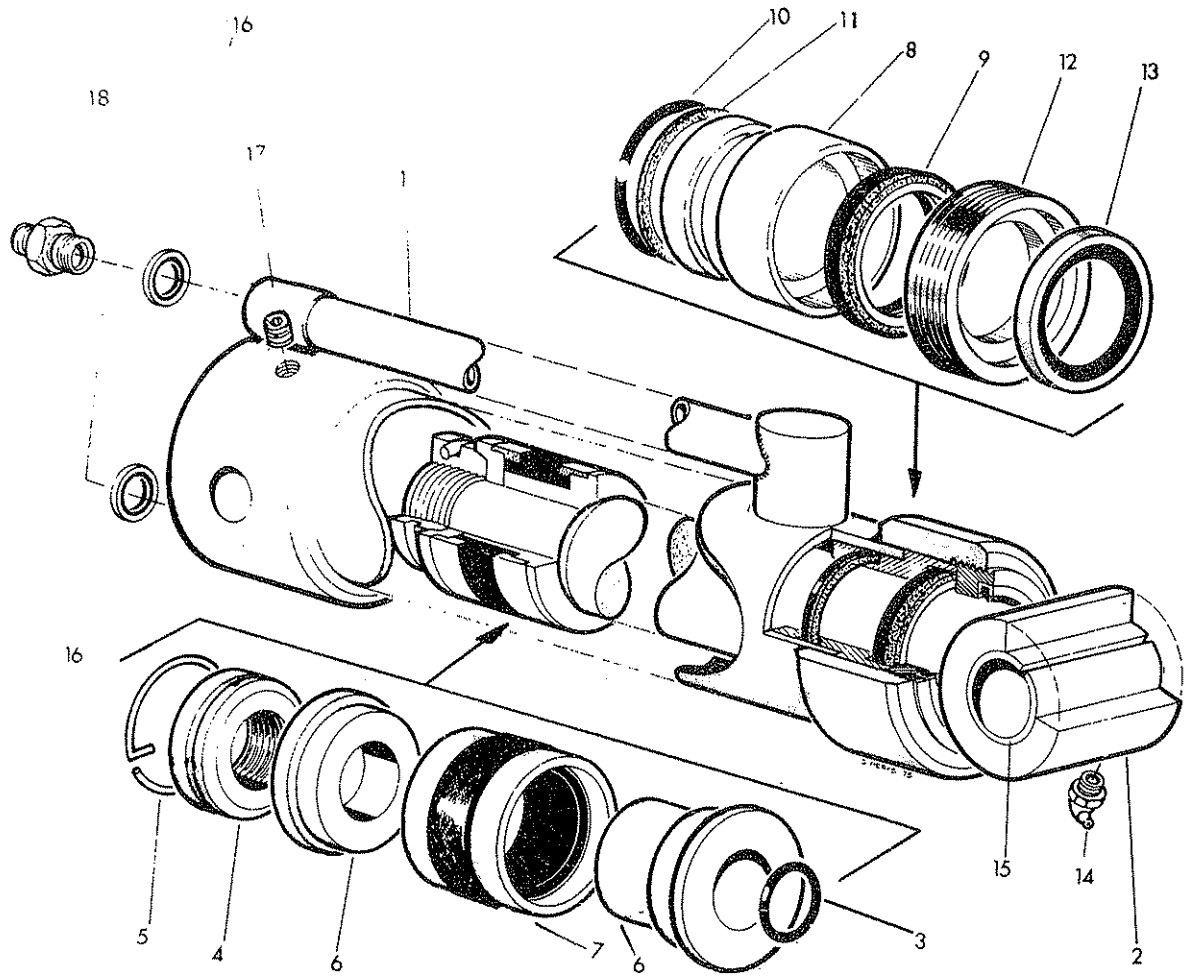
Seal Kit 86 99 154 comprising ref. nos. 6, 8, and 9.

# REACH RAM



Ref	Part No.	Qty	Description
	71 11 283		REACH RAM ASSEMBLY
	71 11 316		.Ram basic comprising :-
1	71 03 304	1	..Ram cylinder
2	71 01 095	1	..Ram rod c/w bush 'O' ring and nut
3	86 00 119	1	... 'O' ring for piston rod
4	71 01 096	1	..Piston nut c/w locking ring
5	71 01 152	1	... Locking ring
6	71 01 097	1	..Piston assembly c/w seal
7	86 35 131	1	... Piston seal
8	71 01 099	1	..Gland housing c/w seal and 'O' ring
9	86 22 127	1	... Gland seal
10	86 00 304	1	... 'O' ring
11	86 09 304	1	... Anti-extrusion ring
12	71 01 100	1	..Gland nut c/w wiper
13	86 40 328	1	... Piston rod wiper
14	09 01 124	2	.Greaser
15	71 05 050	2	.Bush rod end
16	85 81 145	2	.Union 3/8" BSP - 1/4" BSP MM
17	86 50 103	2	.Bonded seal
	86 99 102		RAM SEAL KIT

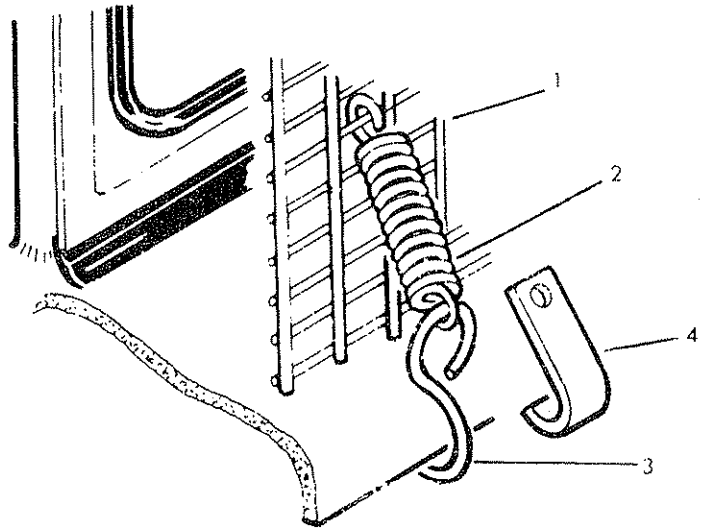
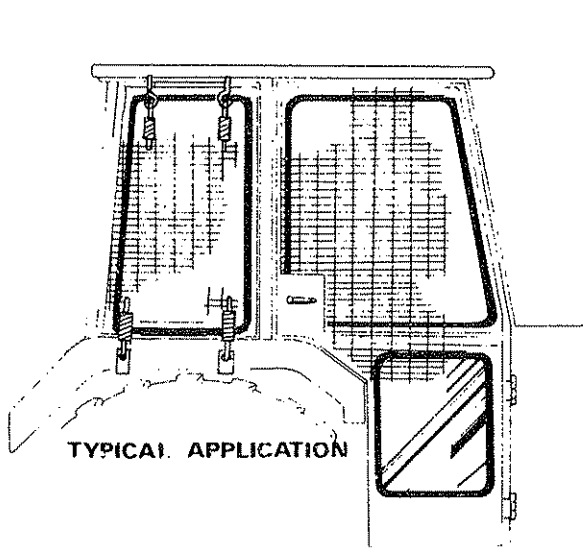
# ANGLING RAM



Ref	Part No.	Qty	Description
	71 11 342		ANGLING RAM ASSEMBLY
	71 11 316		.Ram basic comprising :-
1	71 03 304	1	..Ram cylinder
2	71 01 095	1	..Ram rod c/w bush 'O' ring and nut
3	86 00 119	1	... 'O' ring for piston rod
4	71 01 096	1	..Piston nut c/w locking ring
5	71 01 152	1	... Locking ring
6	71 01 097	1	..Piston assembly c/w seal
7	86 35 131	1	...Piston seal
8	71 01 099	1	..Gland housing c/w seal and 'O' ring
9	86 22 127	1	...Gland seal
10	86 00 304	1	... 'O' ring
11	86 09 304	1	...Anti-extrusion ring
12	71 01 100	1	..Gland nut c/w wiper
13	86 40 328	1	...Piston rod wiper
14	09 01 124	1	.Greaser
15	71 05 050	1	.Bush rod end
16	86 50 103	2	.Bonded seal
17	85 82 041	1	.Taper plug 1/8" BSP T
18	85 81 145	2	.Union 3/8" BSP 1/4" BSP M-M
	86 99 102		RAM SEAL KIT

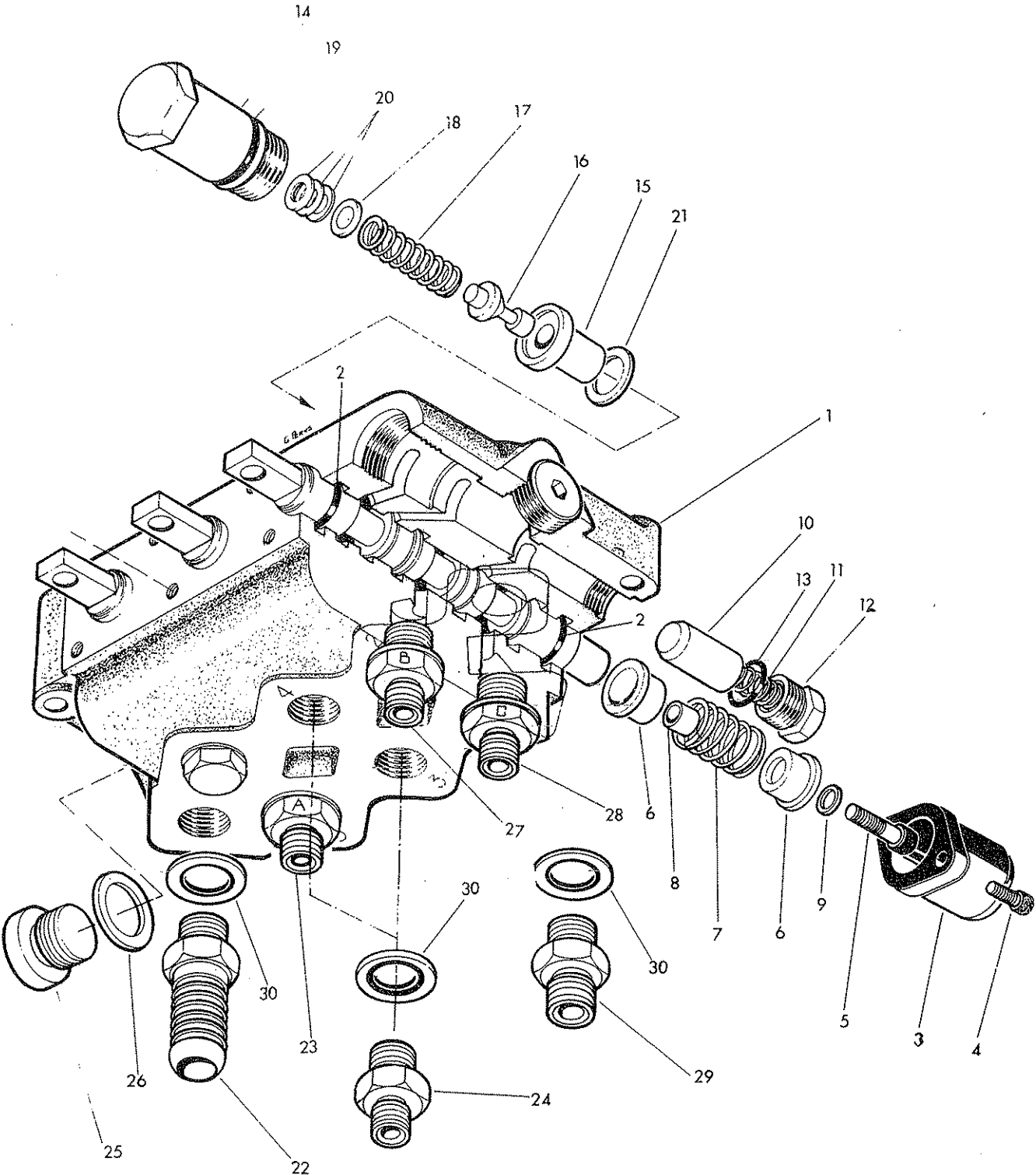
\* Angling ram for machines prior to Serial No. 03 HD 81 see page 56.

# CAB GUARD



Ref	Part No	Qty	Description
	73 13 324	1	CAB GUARD KIT comprising:-
1	73 13 049	1	.Guard panel large
1	73 13 050	1	.Guard panel small
2	60 01 064	12	.Spring
3	60 01 065	6	.Hook
4	73 13 051	6	.Hook

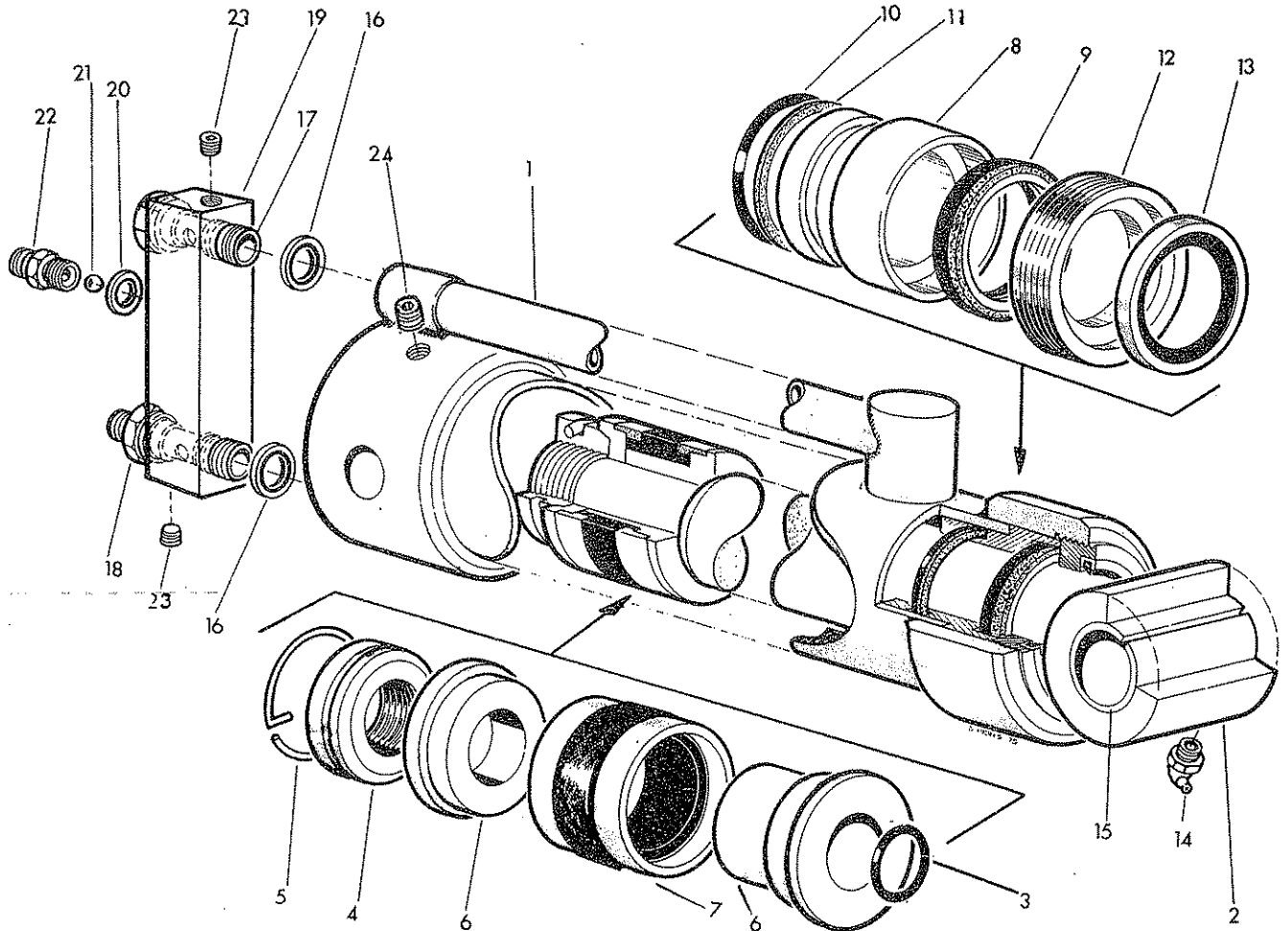
CONTROL VALVE



Ref	Part No.	Qty	Description
	81 30 257		HYDRAULIC CONTROL ASSEMBLY
	81 30 256	1	..Valve c/w connections
1	81 30 252	1	..Valve block c/w spools '0' rings
2	86 00 112	6	... '0' ring
3	81 30 002	3	..Centring spring cover
4	93 43 022	6	..Socket headed capscrew M5 x 12
5	93 83 043	3	..Set screw M6 x 20
6	81 30 003	6	..Centring spring cup
7	81 30 004	3	..Centring spring
8	81 30 005	3	..Distance piece
9	81 30 020	3	..Washer
	81 30 022	1	..non-return valve assembly comprising:-
10	81 30 006	1	...Supply check valve
11	81 30 007	1	...Spring
12	81 30 008	1	...Plug
13	86 00 501	1	... '0' ring
	81 30 023	1	..Relief valve assembly
14	81 30 045	1	...Relief valve body
15	81 30 016	1	...Relief valve seat housing
16	81 30 015	1	...Relief valve needle
17	81 30 011	1	...Relief valve spring
18	81 30 044	1	...Washer
19	86 00 113	1	... '0' ring
20	81 30 043	as reqd	...Shim
21	81 30 017	1	...Sealing washer
22	81 25 008	1	..Return connection 5/8" bore
23	81 30 046	1	..Restrictor union 'A' ¼ BSP - 3/8 BSP
24	85 81 145	2	..Union 3/8" BSP - ¼" BSP M - M
25	81 30 061	1	..Cap
26	81 30 064	1	...Copper sealing washer
27	81 30 047	1	..Restrictor union 'B' ¼" BSP - 3/8" BSP
28	81 30 048	1	..Restrictor union 'C' ¼" BSP - 3/8 " BSP
29	60 00 113	1	..Union 3/8" BSP M - M
30	86 50 103	8	..Bonded seal 3/8" BSP
	86 99 163		SEAL KIT



# ANGLING RAM



Ref	Part No.	Qty	Description
	71 11 317		ANGLING RAM ASSEMBLY
	71 11 316		.Ram basic comprising :-
1	71 03 304	1	..Ram cylinder
2	71 01 095	1	..Ram rod c/w bush 'O' ring and nut
3	86 00 119	1	... 'O' ring for piston rod
4	71 01 096	1	..Piston nut c/w locking ring
5	71 01 152	1	...Locking ring
6	71 01 097	1	..Piston assembly c/w seal
7	86 35 131	1	...Piston seal
8	71 01 099	1	..Gland housing c/w seal and 'O' ring
9	86 22 127	1	...Gland seal
10	86 00 304	1	... 'O' ring
11	86 09 304	1	...Anti-extrusion ring
12	71 01 100	1	..Gland nut c/w wiper
13	86 40 328	1	...Piston rod wiper
14	09 01 124	1	.Greaser
15	71 05 050	1	.Bush rod end
16	86 50 103	4	.Bonded seal
17	81 30 054	1	.Banjo bolt 3/8" BSP
18	81 30 049	1	.Banjo union 1/4" BSP - 3/8" BSP
19	71 11 318	1	.Shuttle block c/w ball, union and seal, etc.
20	86 50 102	1	..Bonded seal 1/4" BSP
21	09 05 114	1	..Steel ball 7/16" diameter
22	85 81 169	1	..Union 1/4" BSP - 1/4" BSP
23	85 82 041	2	..Taper plug 1/8" BSPT
24	85 82 041	1	. Taper plug 1/8" BSPT
	86 99 102		RAM SEAL KIT

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