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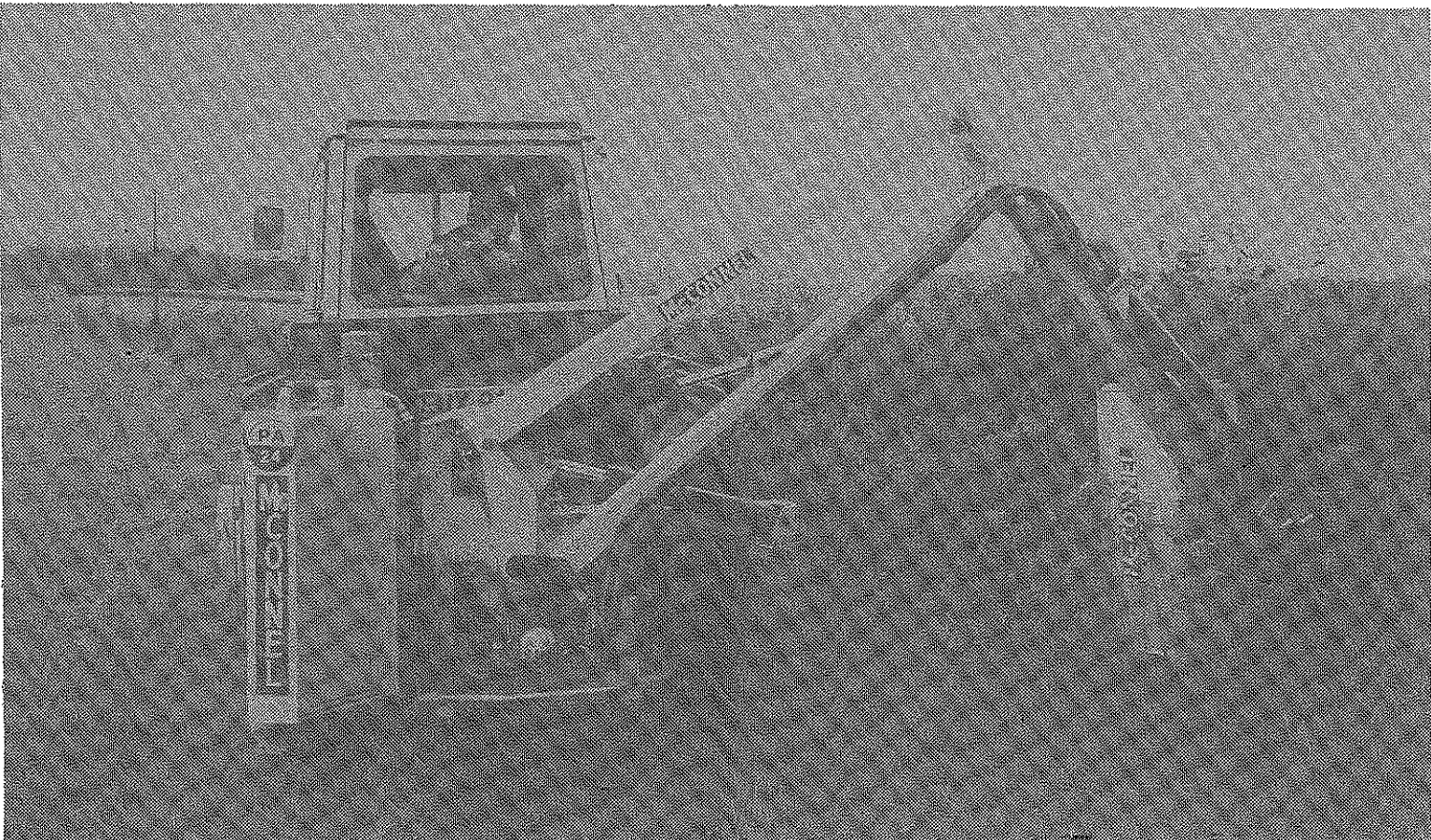
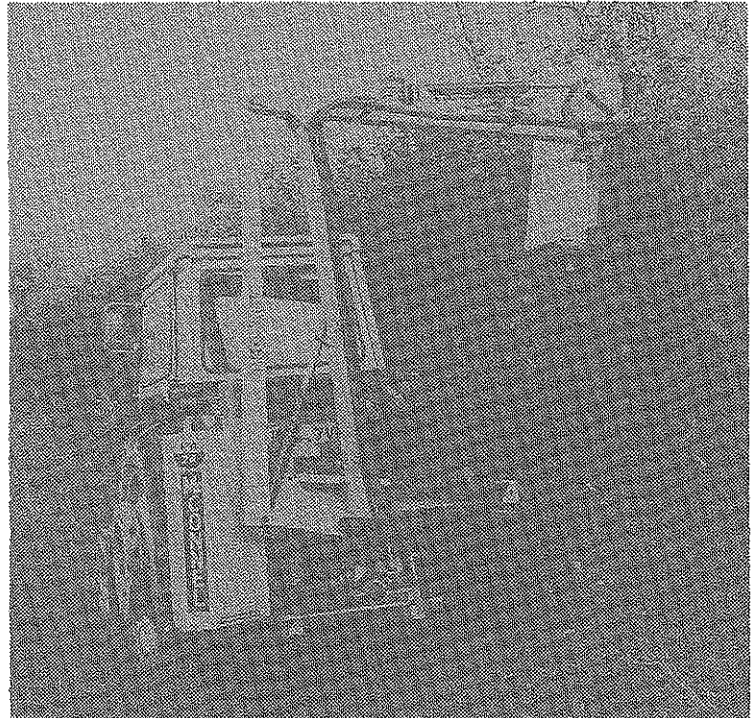
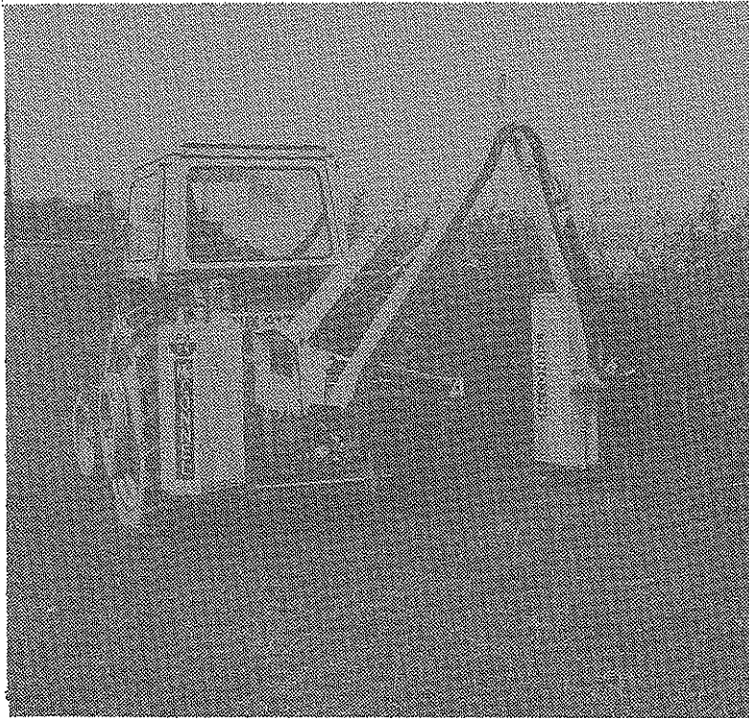
Amended Aug 83

Part No

71-14-851

# POWER ARM 24 MK.II

## Operation & 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.

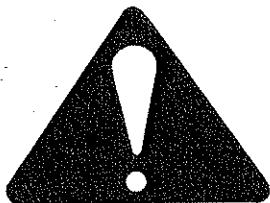
### Left and Right-Hand

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<br>SERIAL<br>NUMBER   | INSTALLATION<br>DATE |
| MODEL<br>DETAILS  |                      |
| DEALERS<br>NAME   |                      |
| DEALERS<br>TELEPHONE<br>NUMBER  |                      |

## SECTION 1

### SAFETY PRECAUTIONS

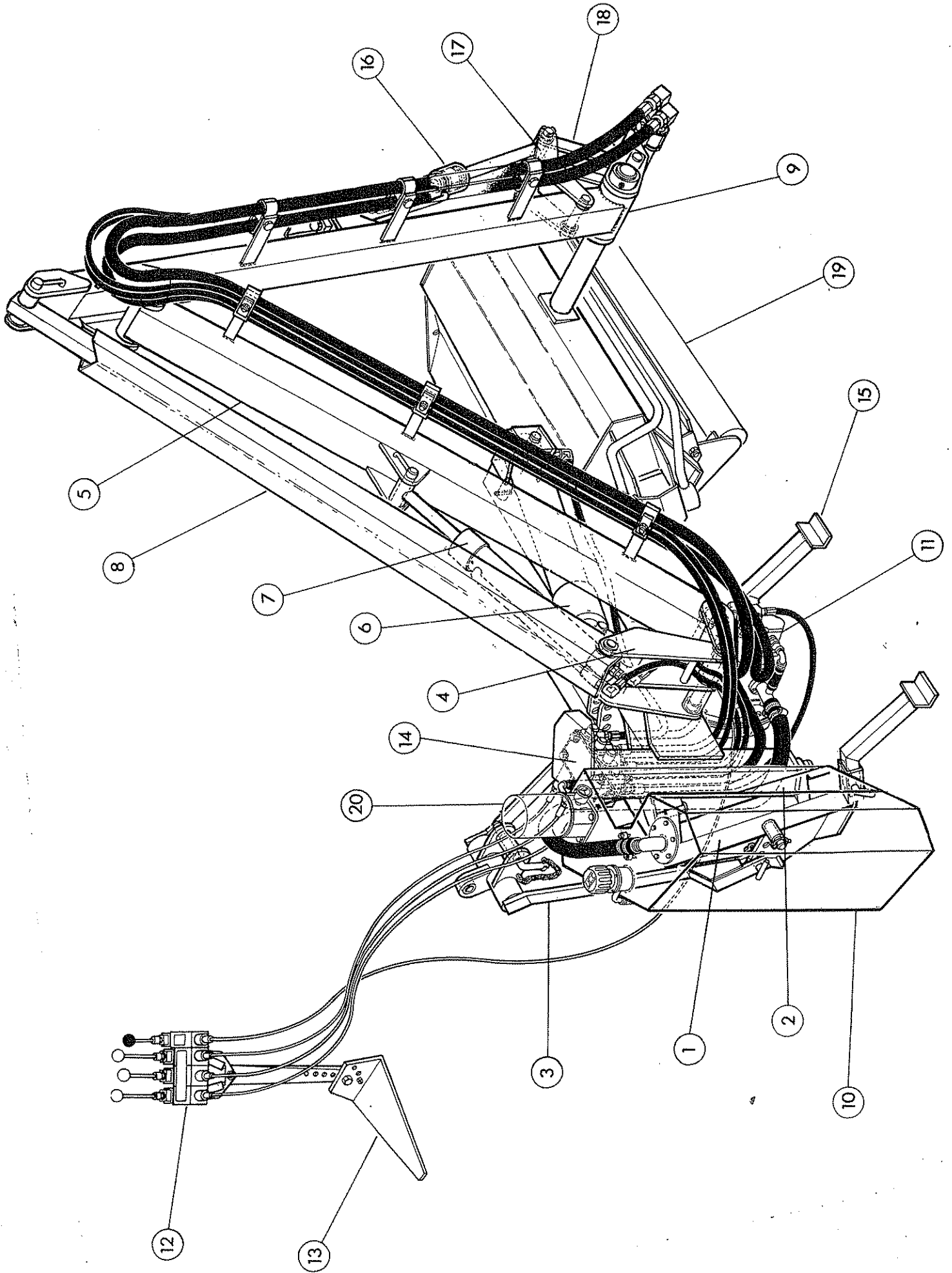


## WARNING

- 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 hydraulically driven hedgetrimmer designed to fit on the three point linkages of the great majority of tractors without having to use extra brackets or fittings.

All power for the operation of the rotor is provided by a high performance pump unit that is operated from the tractor's p.t.o. shaft. The machine carries its own oil reservoir incorporating a 10 micron full flow filter.

The Power Arm 24 can be supplied in two models, fully independent or tractor supply. The fully independent model which is fitted with a tandem pump should be specified where any doubt exists on the hydraulic oil supply from the tractor. The economy version which utilises the tractor's hydraulic oil supply to provide movement of the arms is fitted with a single pump for operation of the rotor.

The models also differ in that engagement of the rotor drive on the tractor supply model is effected by operation of the tractor's p.t.o. lever, while on the independent version a rotor control valve is operated by an extra lever on the control console within the cab.

The flail head has been designed to operate on the right hand side of the tractor only and flail rotation can be altered for upward or downward cutting. A front hood for upward cutting is standard equipment and a rear hood necessary for downward cutting is an option. 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 built-in stand and the minimum of effort is required for fast hitching on and off the tractor.

### OPTIONAL EXTRAS

An electric solenoid control kit is available either as original equipment or for conversion from cables. For variables in operation, installation, maintenance and spare parts refer to Instruction supplement 145.

A 1.2 metre hedge flail head part no 71 14 454 is now available.

## 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 p.t.o. shaft to enable forward movement to be halted while the flail head continues to operate.

### 4. Oil Supply

On both models the relief valve setting in the control valve is  $160 \text{ kg/m}^2$  (2300 p.s.i.) therefore if operating from tractor supply the tractor's relief valve setting must be at least a little above this figure for satisfactory operation. Oil flow rates are not crucial. Flow rates of up to 45 l/min (10 g.p.m.) should not have any adverse affect to the 'inching' response that is sometimes required from the control valve.

On all tractors where a double-acting service spool valve is provided, this service should be used and connected to the Power Arm 24 through the tractor's own hydraulic coupling.

The return through the tractor's auxiliary spool valve creates higher back pressure than is normally acceptable and the security of the return line from the machine to the tractor should be checked. Double hose clips are fitted as standard to minimise the risk of the hose blowing off.

Where a double-acting service is not available then an auxiliary service must be taken from the trailer pipe connection and a return line provided to the tractor according to the tractor manufacturers instructions.

Return adaptors are available from F.W. McConnel Ltd for specific tractors on request.

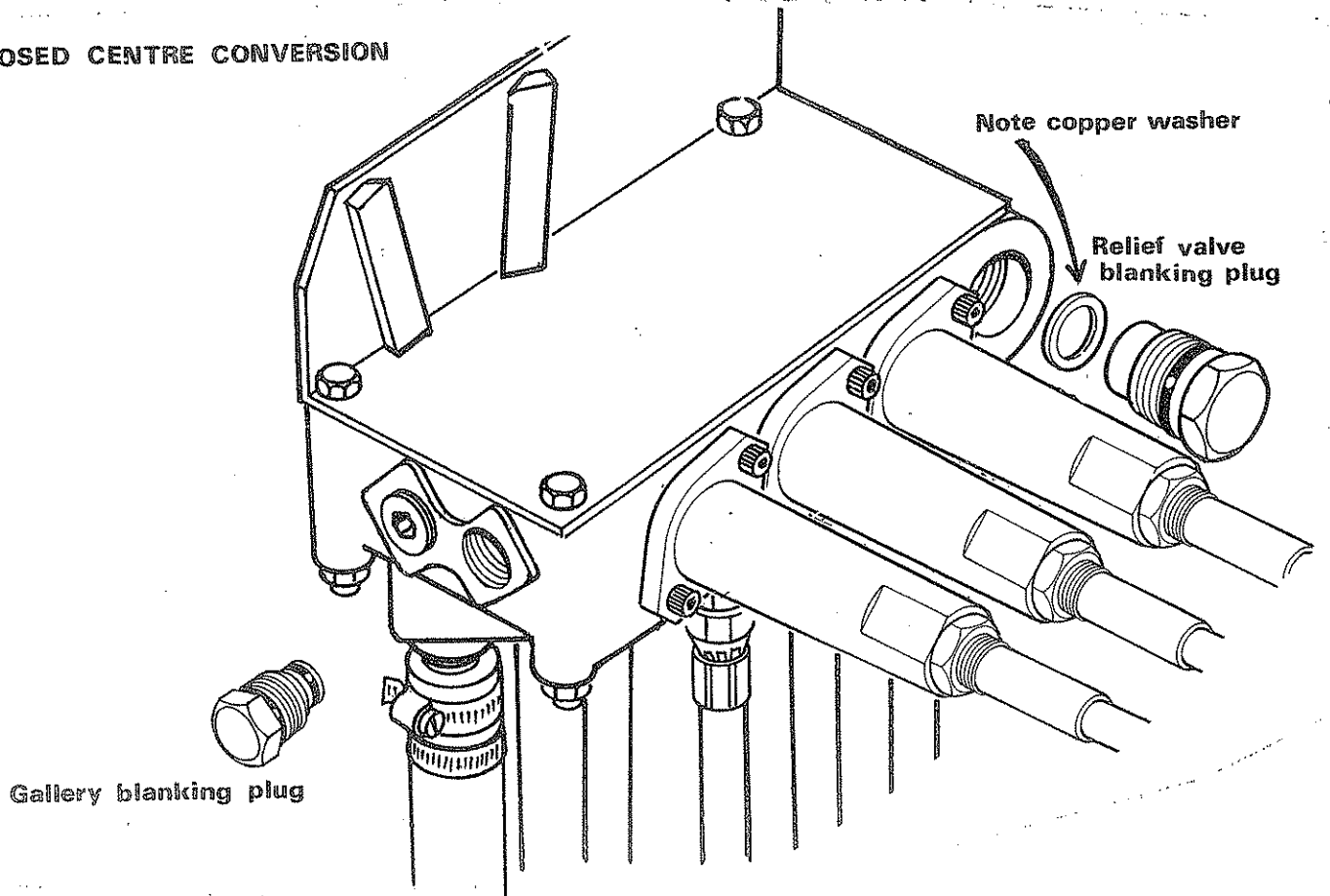
### 5. John Deere

Although it is recommended to use the independent model Power Arm 24 with a John Deere, it is practicable for the tractor supply machine to be used subject to certain modifications. There are two alternatives.

- i) A flow limiting valve manufactured by John Deere is available to provide an 'open centre' external supply sufficient for the PA24 requirement. For further advice consult your John Deere dealer.
- ii) Components are available from F.W. McConnel Ltd to convert the standard open centre valve on the machine to 'closed centre'. The kit (part no. 81 30 059) consists of a relief valve blanking plug which should be installed in place of the existing relief valve, and a pressure gallery blanking plug which is installed in place of the standard blanking plug at the valve outlet end.



## CLOSED CENTRE CONVERSION



### 6. 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 utilised.

### 7. Linkage isolation

Although it may be possible to operate the tractor supply model without linkage isolation, a severe strain would be put upon the attachment yoke and pins. Most modern tractors are equipped with a ready means of providing linkage isolation through a conveniently operated valve. Linkage isolation is not required on the independent machine and the tractor's hydraulic controls should be neutralised.

### 8. Check chains/stabilizers

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

### 9. 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 alone 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.

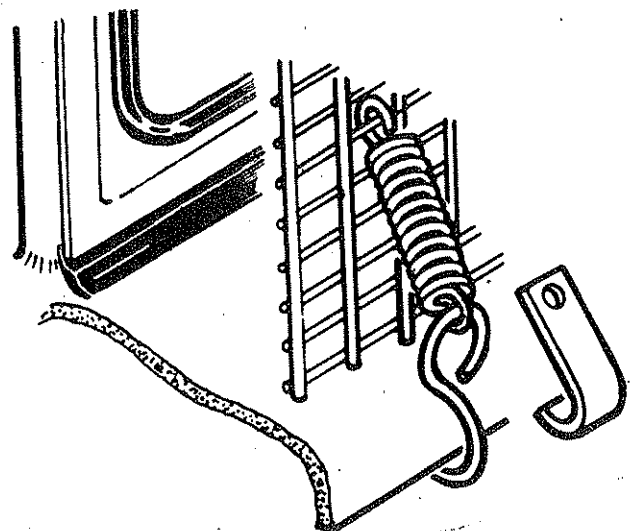
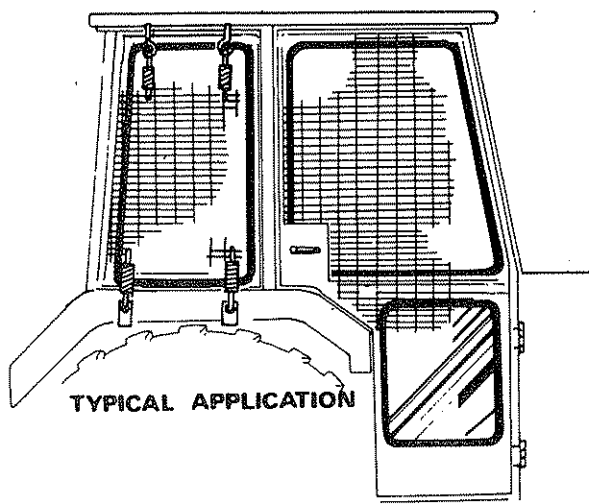
Where the flail is operated on a tractor that is equipped with a safety frame or roll bar only, then an additional frame must be made and fixed to the tractor on to which the guard mesh can be secured. In addition to the guard mesh, a sheet of Polycarbonate transparent glazing must be fitted to the frame 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. Unfortunately it is susceptible to surface damage and scratching, therefore it is advisable to place the material on the inside of the window for protection. No attempt should be made to wipe the sheeting with dirt engrained cloth.

Toughened grades of polycarbonate sheeting are available under the brand names of "Makrolon", "Tuffak", and "Lexan".

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

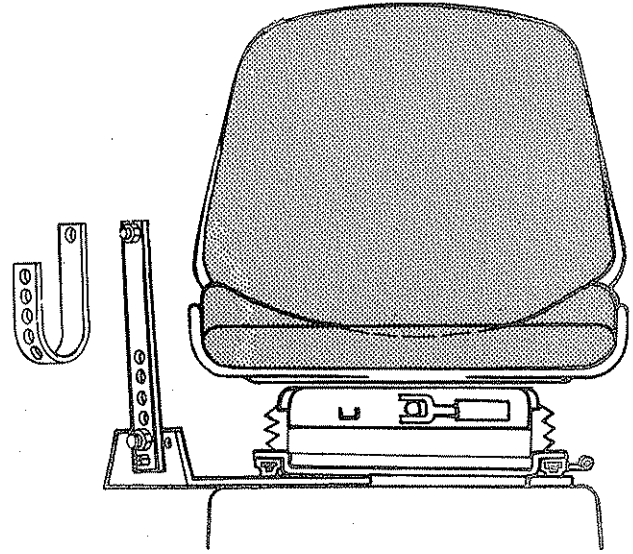
#### CAB GUARD



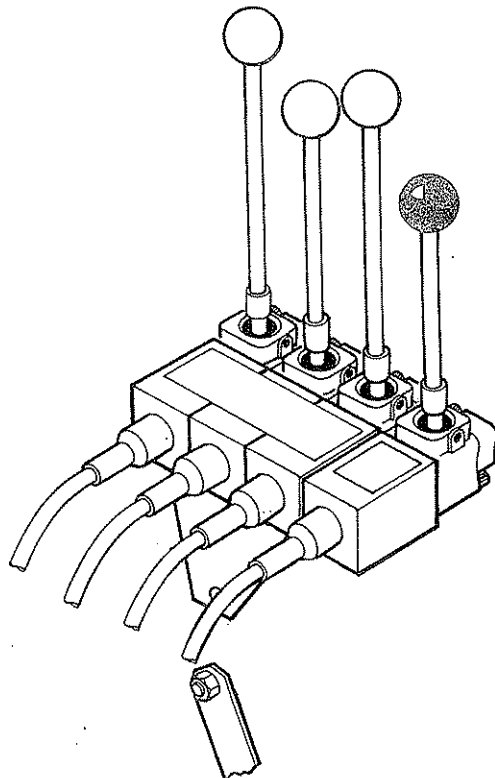
## 2. Fitting of control unit in cab.

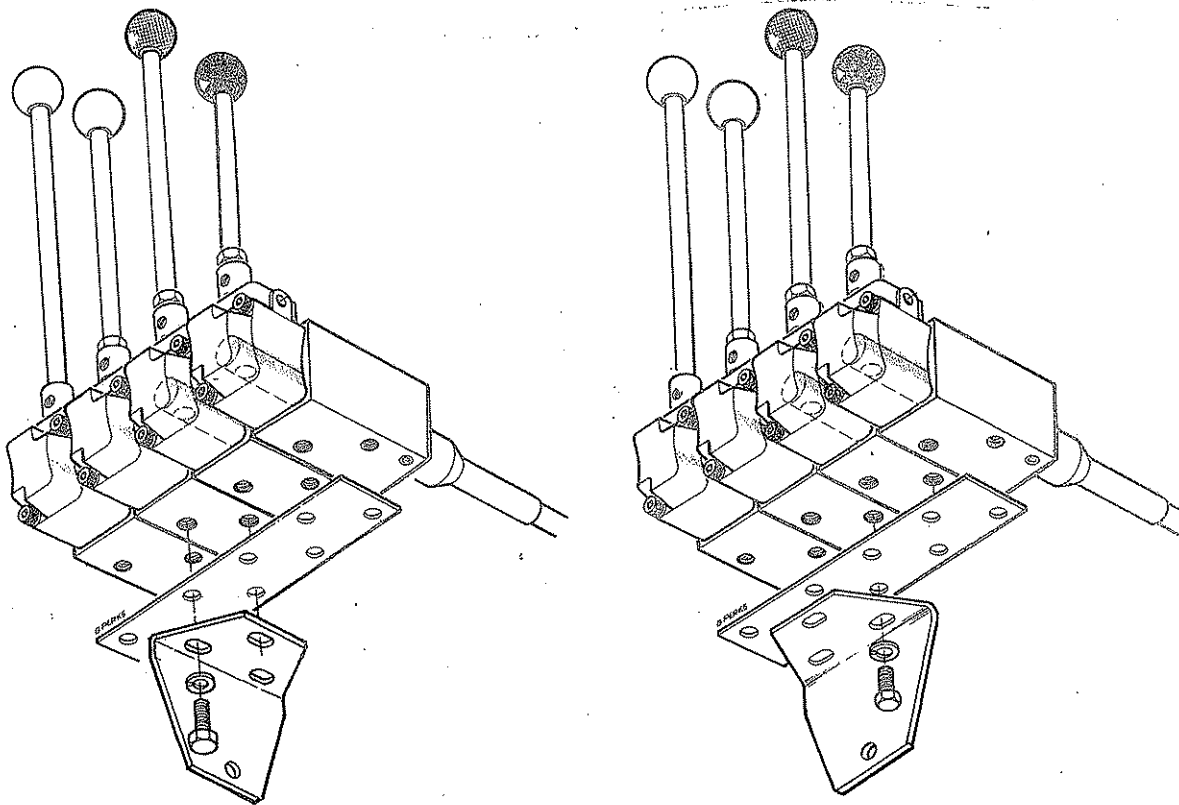
The control box is mounted on an adjustable stalk that is attached to a seat bracket which is of universal design for mounting in many models of tractor. The bracket is normally trapped between the seat runners and their mounting base. It may sometimes be necessary to drill extra holes in the seat bracket 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 an angled mounting bracket in either a transverse or longitudinal position thus giving a variety of mounting positions, which in conjunction with the flexibility of the mounting pillar will enable a satisfactory working position to be achieved.





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".

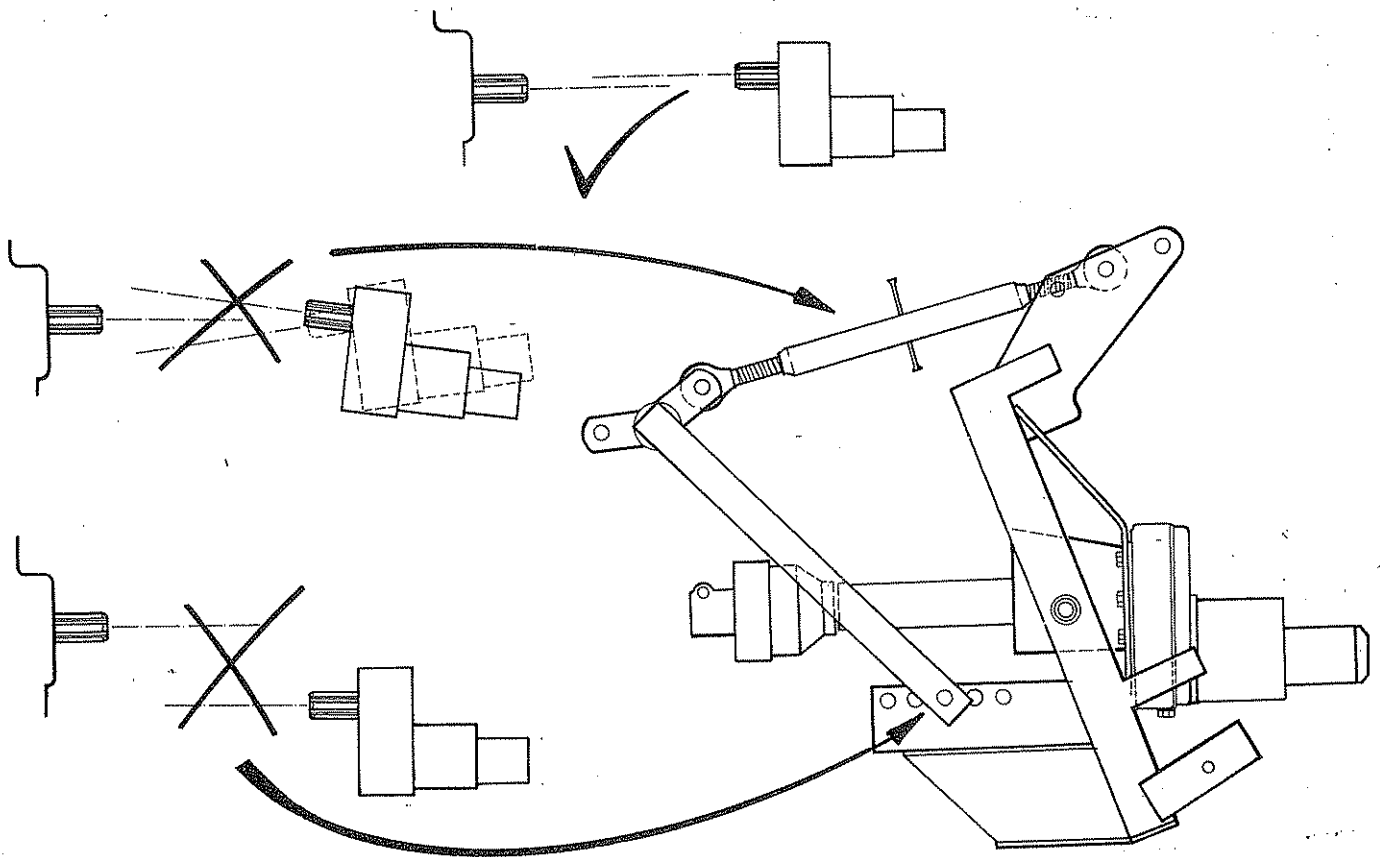
### 3. Machine attachment

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 sidesway.
- 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. Hydraulic installation

For shipping purposes, the reservoir is strapped across the top of the flail head together with the two flail hoods. The reservoir must be mounted to the main frame using the bolts and nuts provided, avoiding possible damage to the hoses by facing the nuts outwards.

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. Also fill the large bore supply hose with oil to prime the pump before securing it to the outlet at the top of the reservoir. The total capacity of the system is approximately 100 litres (22 galls). Do not overfill.

| Supplier | Cold or temperate climate                  | Hot climate        |
|----------|--|--------------------|
| Castrol  | Agricastrol hydraulic oil<br>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.

#### 5. Independent supply

- i) Ensure that the rotor control is in the 'STOP' position and engage tractor pto. Increase engine revs to give approximately 250 rpm at the pto and allow the oil to circulate for two minutes or more under a 'no-load' condition i.e. do not operate any levers.
- ii) Operate arm control levers to raise the flail head clear of the ground and after ensuring that the head is at a safe attitude increase the pto speed to approximately 300 rpm and move the rotor control to 'START' position. Increase pto speed to approximately 360 rpm and after initial surge and fall, the rotor speed should remain steady.
- iii) Move rotor control to 'STOP' position and then operate the flail head throughout its operating range, observing that the hose runs are free from chafing, straining and pinching.
- iv) Re-check the oil level in the tank and top up as necessary

## 6. Tractor supply

- i) Fit the return connection to the tractor and connect up the return hose before connecting up the self-seal coupling to the tractor external services point.
- ii) Ensure p.t.o. lever is in neutral position, and isolate tractor hydraulic linkage.
- iii) Start tractor and select external service supply on the hydraulic controls. Allow the tractor to run for several minutes before attempting to operate any of the machine control levers. Ensure all arm movements function correctly.
- iv) Place the flail head at a safe attitude and bring tractor engine revolutions to 1000 r.p.m. to avoid stalling when the starting load is placed on the motor. Engage p.t.o. and allow the rotor to run for several minutes. Do not leave the tractor cab or allow anyone to approach the flail head at this time.

Caution: Do not allow the pump to continue working if the rotor does not turn - Overheating and serious damage to the pump can be caused in a very short time. It may be necessary to re-prime the pump.

- v) After running up the machine increase p.t.o. speed to approximately 360 r.p.m. and run for a further 5 minutes before disengaging p.t.o. and stopping tractor. The reason for this running period under a no load condition is to thoroughly circulate all the oil in the reservoir through the return line filter.
- vi) Check all hose runs and observe that they are free from any pinching and chafing. Re-check the oil level in the reservoir and top up as necessary.

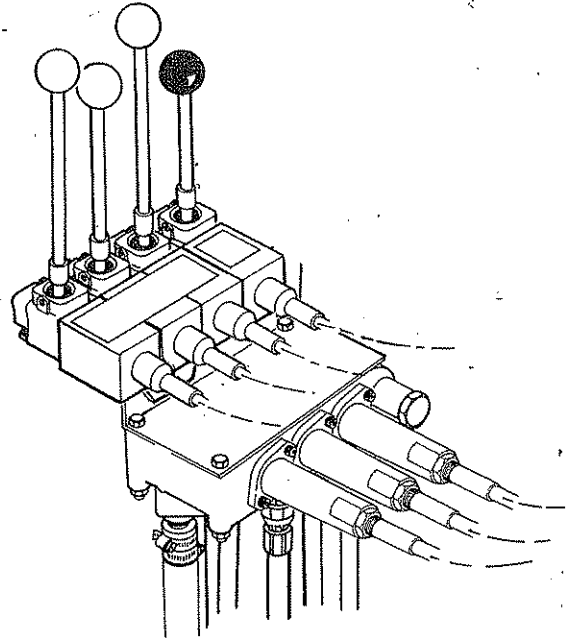
## 7. Machine removal

Note: Dismounting instructions for both models of Power Arm 24 from the tractor are identical except for the disengagement of PTO shaft and the release of supply and return connections on the tractor supply model.

- 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) Unbolt the control assembly from the mounting pillar and re-position as shown in its storage position above the valve on the 'T' frame. The unit should be protected from the ravages of weather by covering or enclosing in a plastic bag.



- 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.



## 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 shapeways.

#### 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 practice 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

### a) Independent model

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.

### b) Tractor supply

Position the flail head to a safe position and horizontal to the ground. Bring tractor engine revolutions to fast idle before engaging p.t.o. shaft.

On both models, allow the rotor to run for a couple of minutes before moving into work.

## 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 stubbly 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.

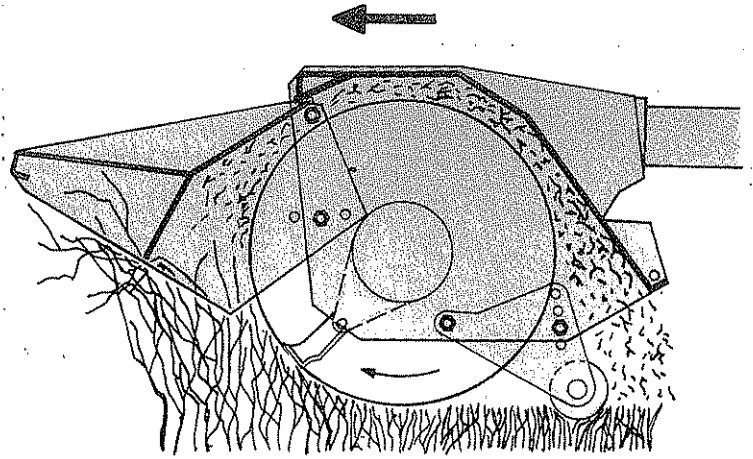
#### WARNING

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

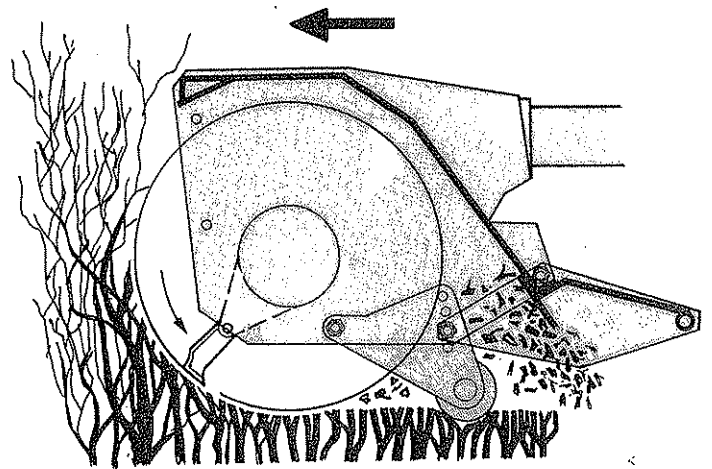
The flail head is assembled at the factory for the flails to cut with an upward motion. Upward cutting produces a cleaner finish, minimises split stems and is ideal for a light hedge that has been regularly maintained.



### 12 Optional Downward Cutting

It is possible to reverse the rotation of the flail for downward cutting in heavy growth. This chopping action subjects the rotor to violent usage and should therefore be avoided whenever possible.

For downward cutting a rear hood is necessary and should be obtained under Part No. 71 14 297. It is permissible to remove the front hood to allow larger material to pass under the flail head.



### 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 individually turned round by releasing the locknut and withdrawing the flail pivot bolt. The flail may then be reversed. On re-assembly, tightening torque of the locknut is 135 Nm or 100 ft/lbs.

#### WARNING

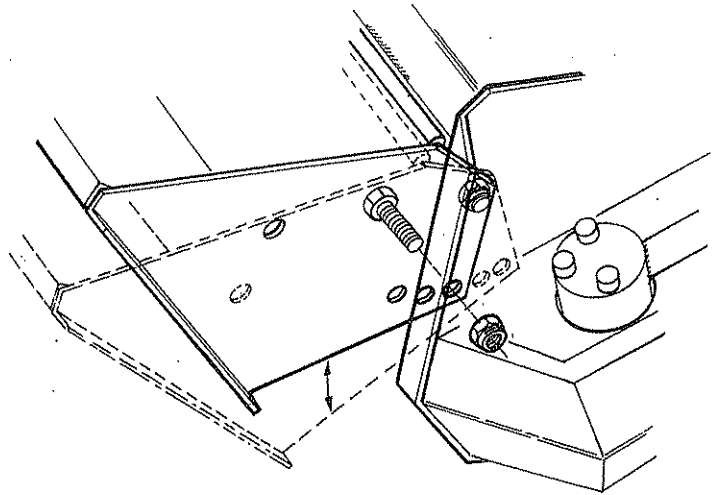
If any wire is picked up by the rotor, the machine should be stopped immediately and the rotor cleared before proceeding.

### Offset head

The sliding offset head facility which increases the effective reach of the flail head by 13½" (0.35 metres) was introduced in December 1982. Adjustment is carried out by resting the flail head on the ground in a vertical position before loosening the clamping nuts. Operate the lift ram to alter the head position and firmly retighten the clamping nuts before raising the flail head from the ground.

#### 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.

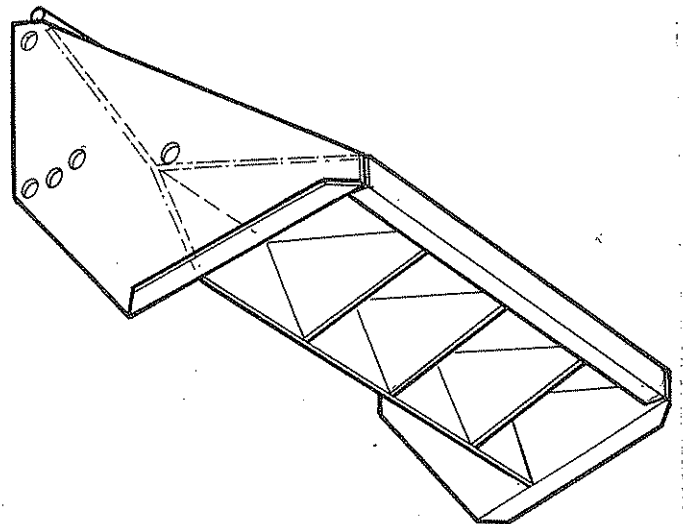


Note: The two hoods are not interchangeable on the flail head.

#### 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.

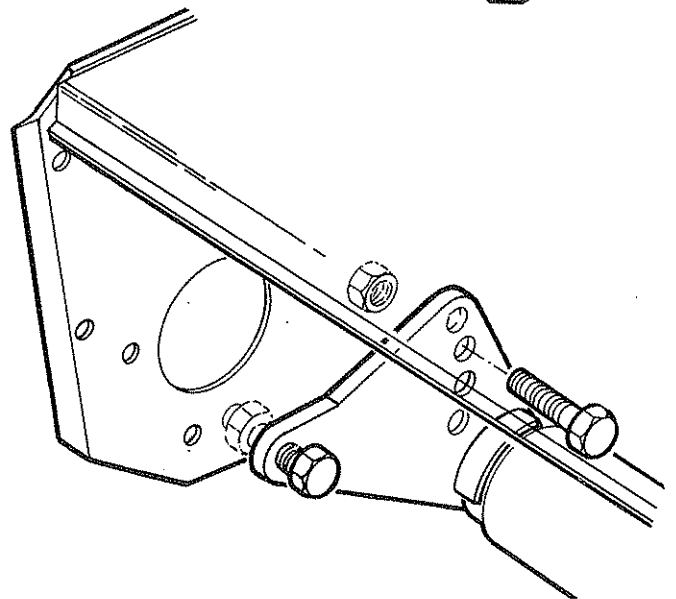
Furthermore this wire trap does not relieve the operator of the responsibility of checking and cleaning the flail when it is suspected that wire has caught in the rotor.



#### 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

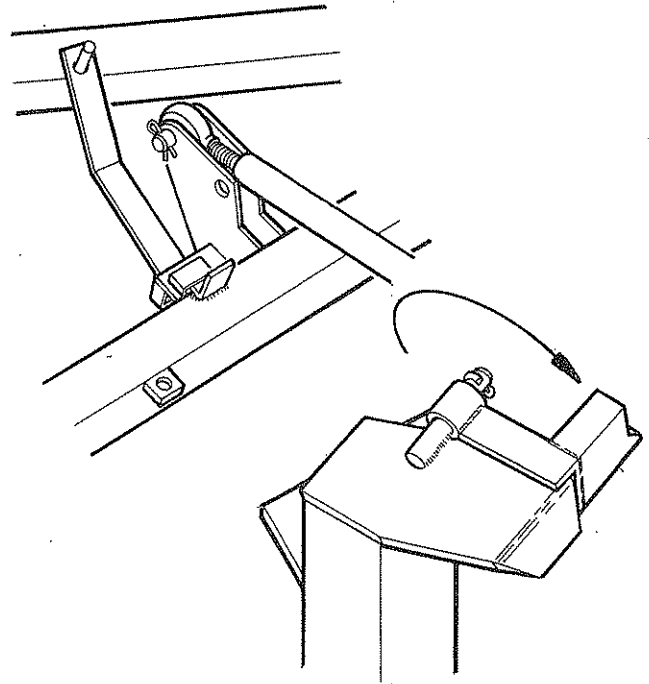
When the flail head meets an obstruction and the tractor continues to move forward, the complete armhead which is hinged on the frame will be forced backwards and upwards at the same time in an effort to clear the obstruction. Resetting of the breakaway is completely automatic with the armhead returning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

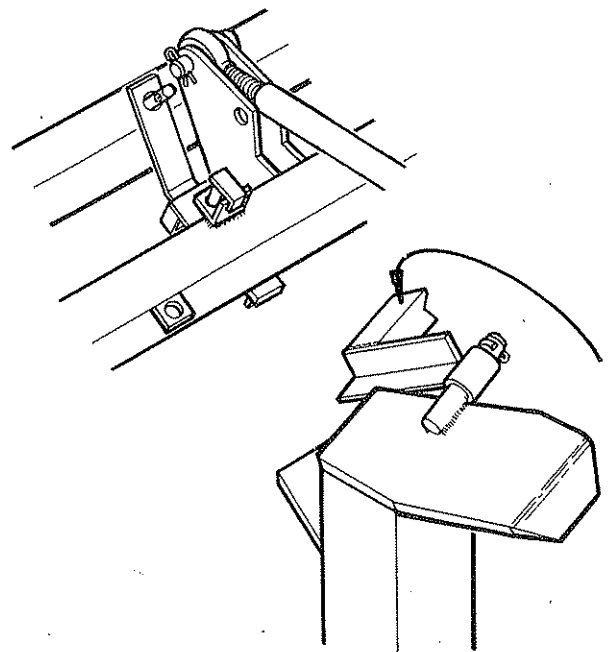
This is best done by releasing the lock pin, placing the flail head on the ground and driving forwards, while at the same time operating the 'main arm down' lever.

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

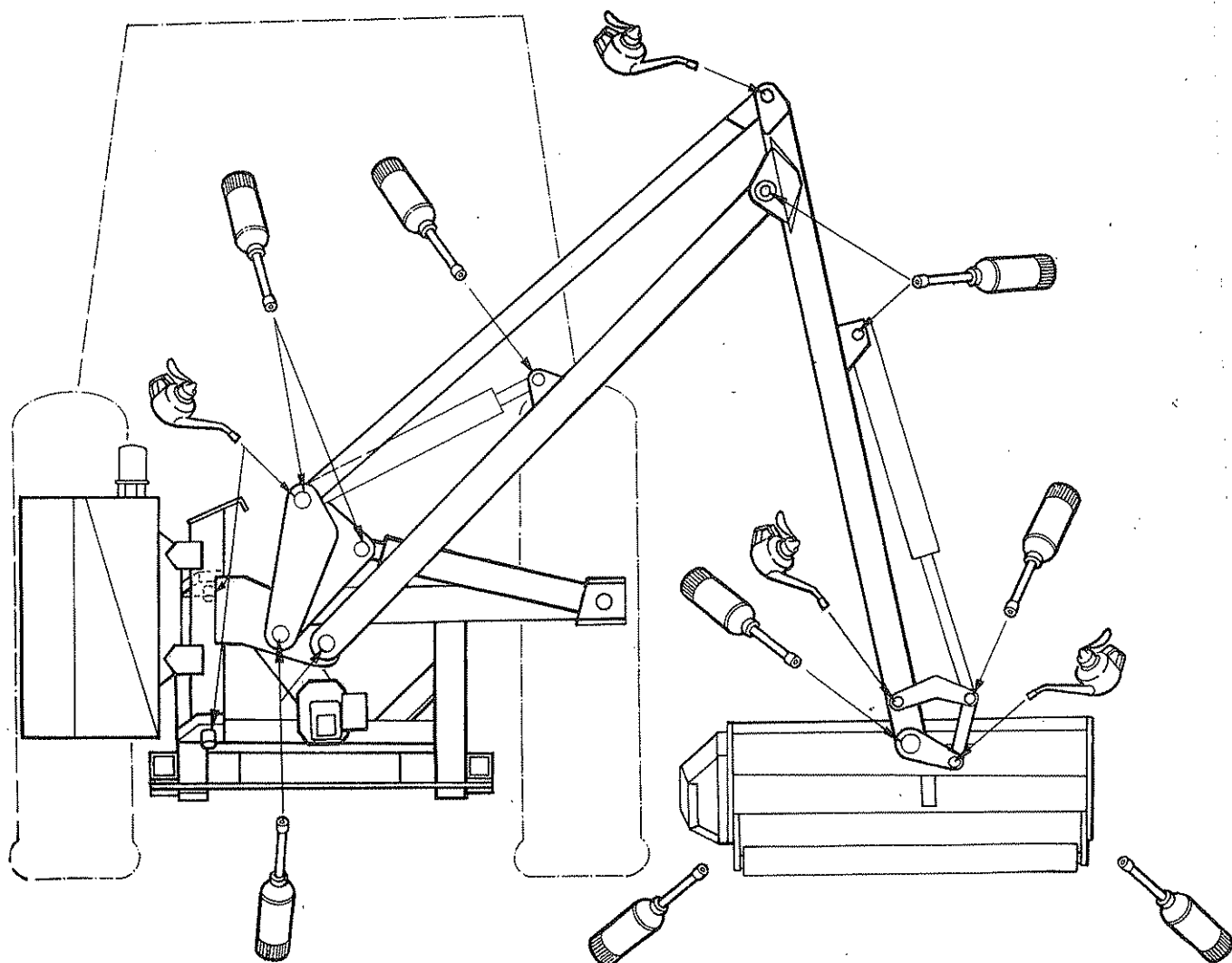
### MAINTENANCE

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 99 166 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.

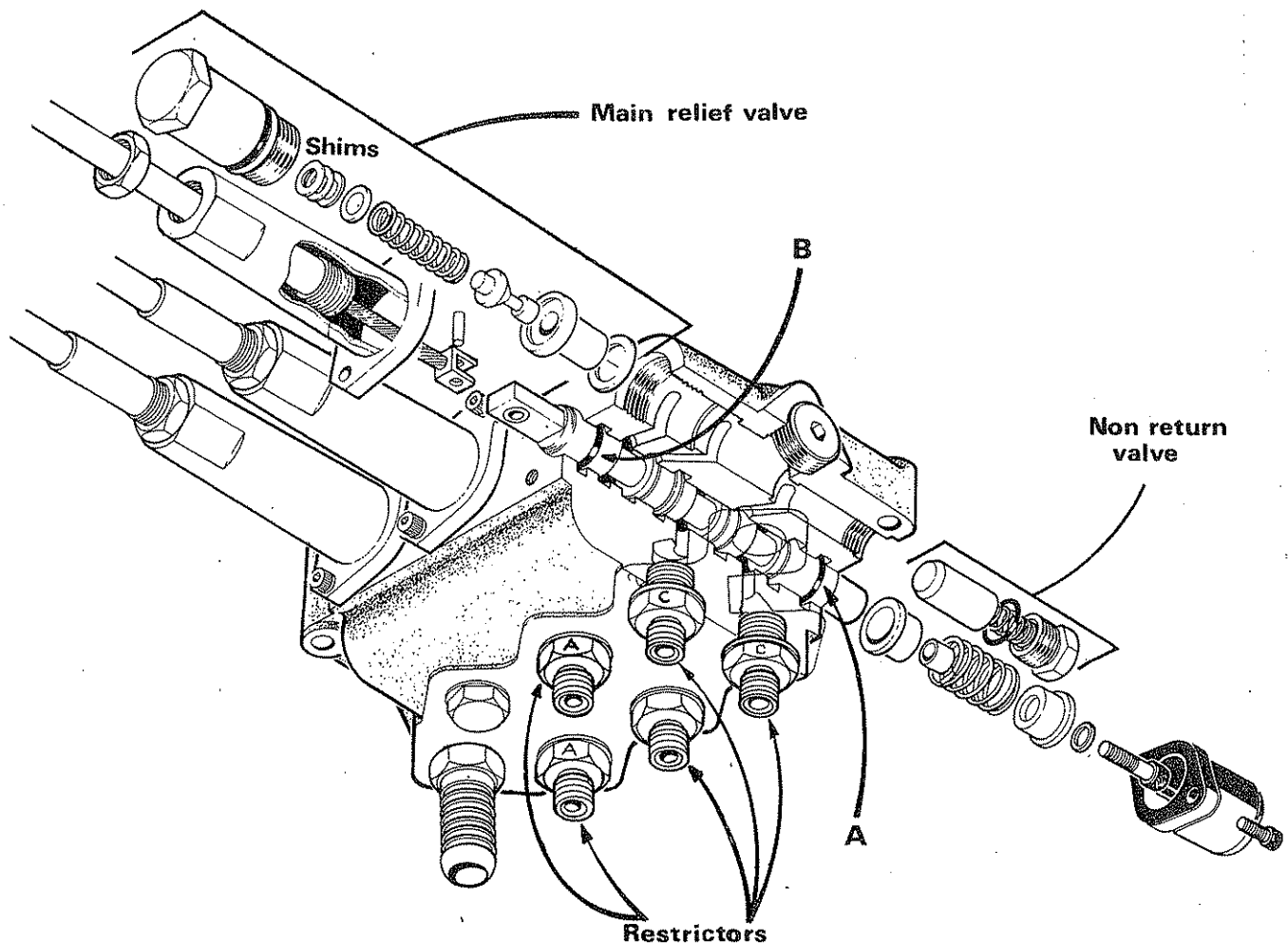
CAUTION: On no account should any attempt be made to lubricate the cables which are assembled with a special lubricant during manufacture.

## 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.

Bolts and nuts securing the flails to the rotor should be regularly checked and kept tight. The correct torque setting for these locknuts is 135 Nm (100 lbf/ft). Use only the correct flail bolt and locking nut and ensure that the spring washer is in good condition. Check the flail pivot bushes for possible damage or wear. They do not require oil.

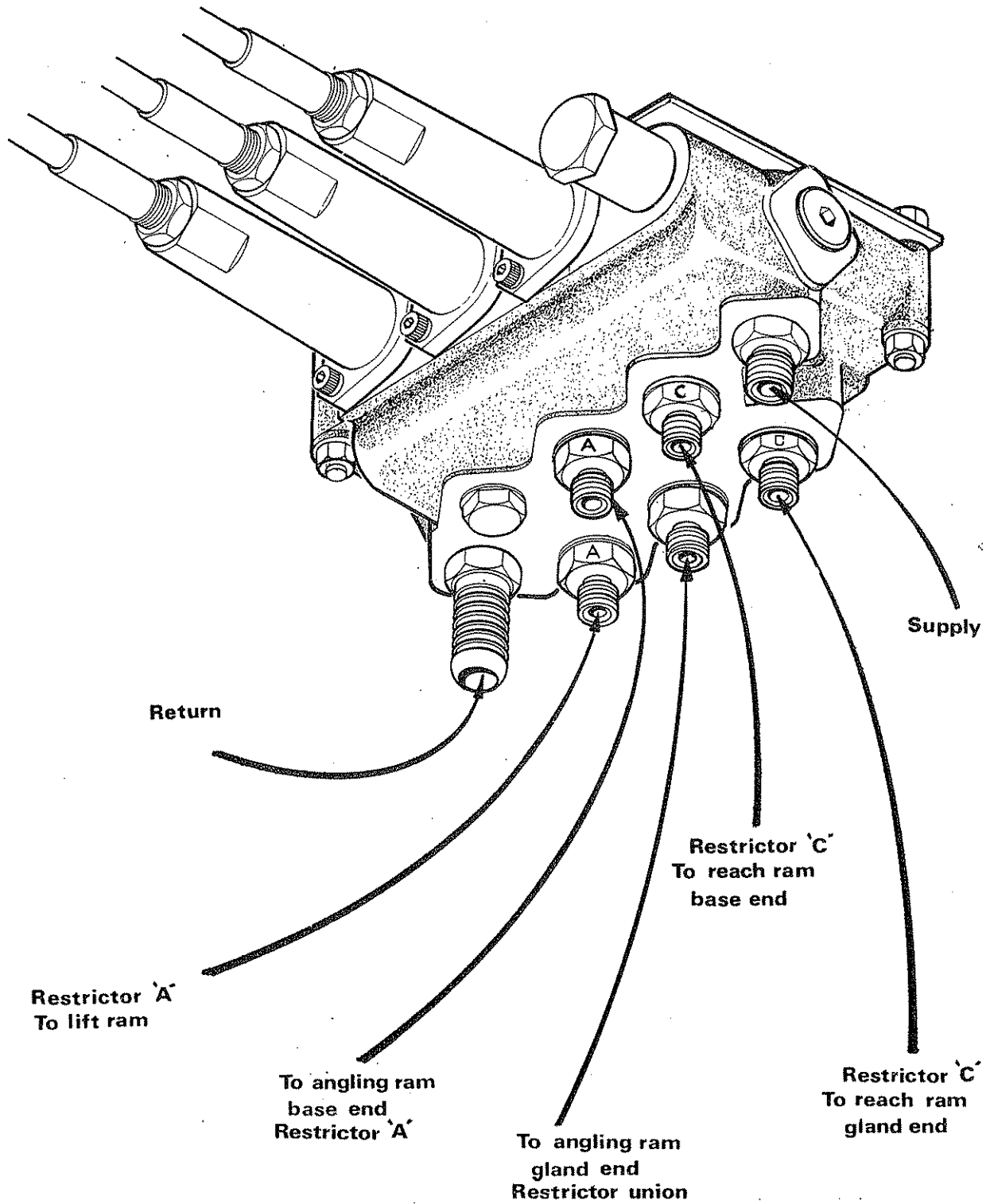
Do not attempt to run the rotor with flails missing. Im-balance will cause severe vibration and can rapidly damage the rotor shaft bearings. As an emergency measure if a flail is broken off or lost, remove another on the opposite side of the rotor to retain balance. Always replace flails in opposite 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. Wear protective gear when sharpening flails.

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

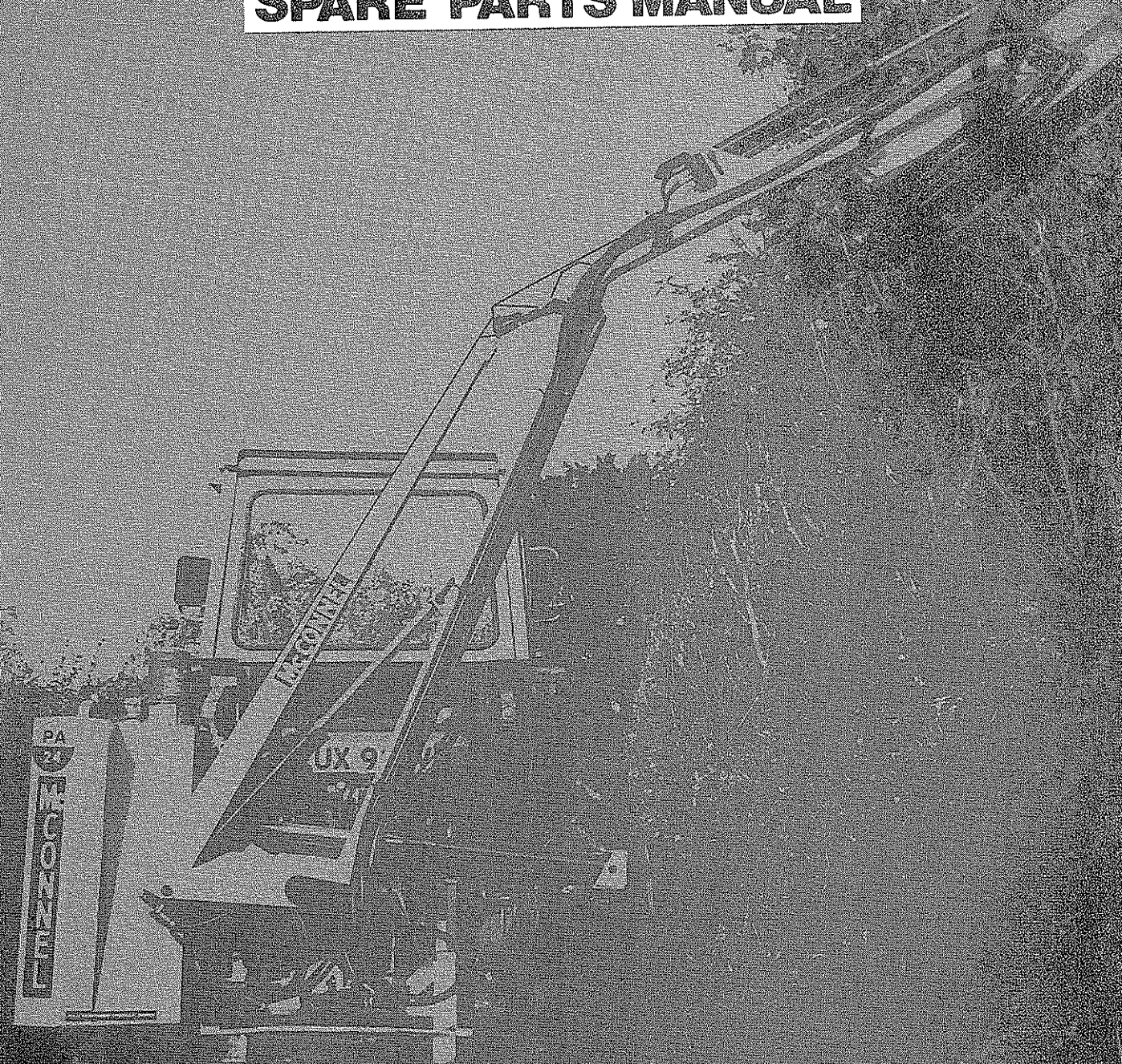


# HOSE CONNECTIONS





# SPARE PARTS MANUAL



## USE ONLY McCONNEL SPARE PARTS

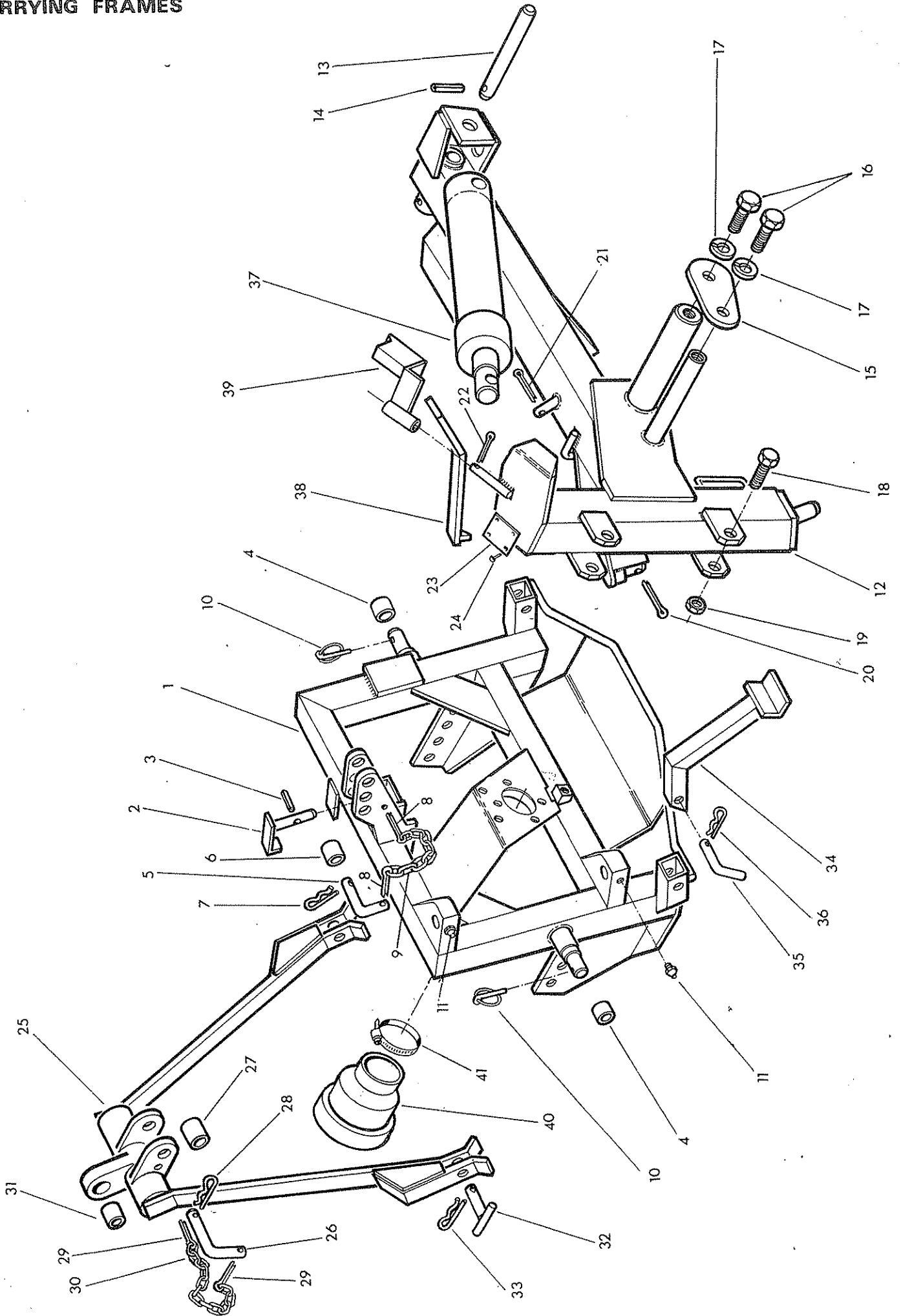
To be assured of the latest design improvements purchase your genuine replacements from the original equipment manufacturer F.W. McConnell Ltd. through your local dealer or stockist. Always quote machine type and serial number as well as the part number.

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.

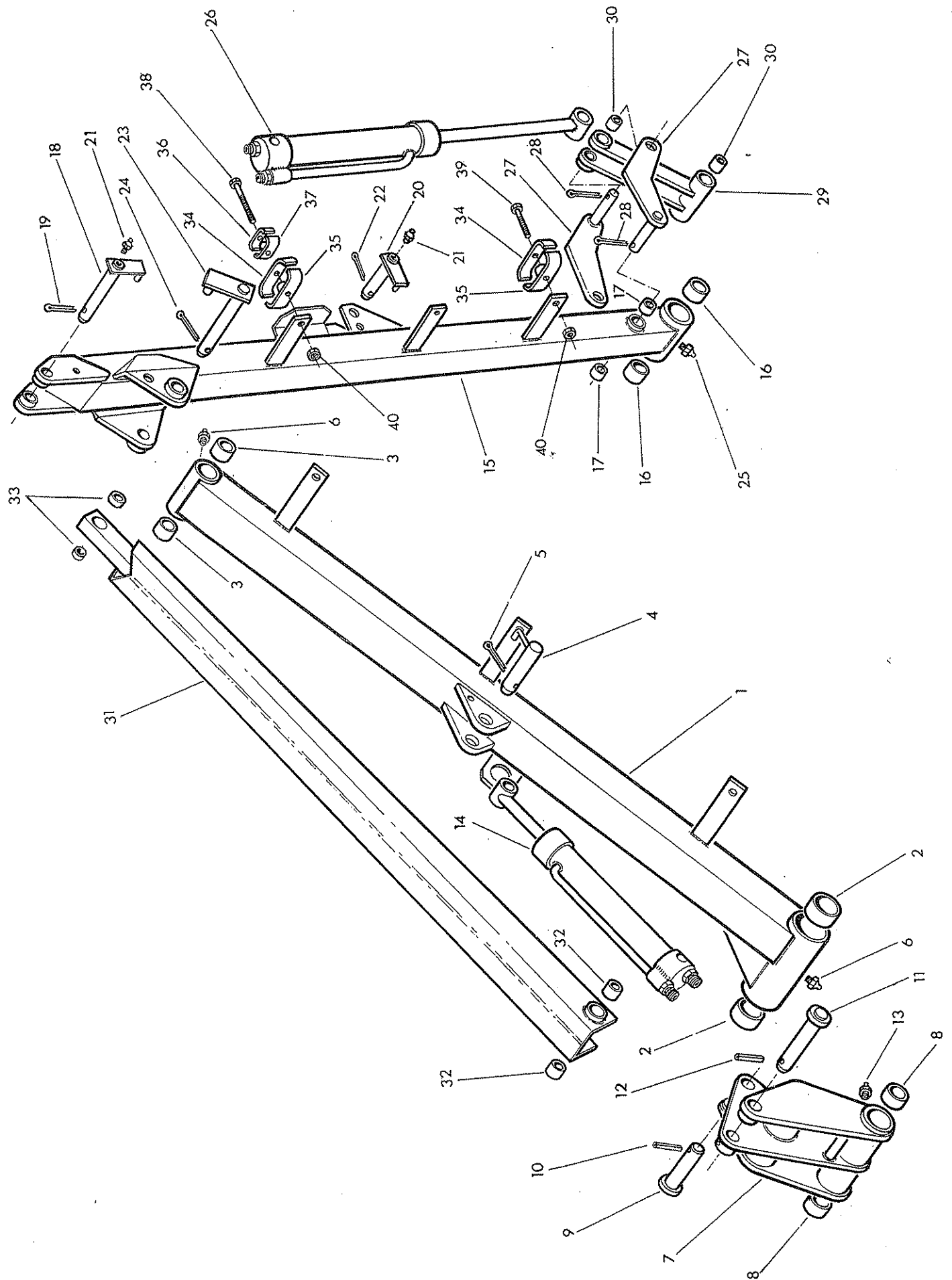
# CARRYING FRAMES



| Ref | Part No.  | Qty | Description                                 |
|-----|-----------|-----|---|
|     | 71 14 350 |     | 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 00 115 | 2   | ..Set screw M20 x 40                        |
| 17  | 91 00 208 | 2   | ..Spring washer $\varnothing 20$            |
| 18  | 93 13 077 | 4   | ..Set screw M16 x 35                        |
| 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 54 )           |
| 38  | 71 11 116 | 1   | .Breakaway strap                            |
| 39  | 71 14 062 | 1   | .Transport stop                             |
| 40  | 71 038    | 1   | .P.T.O. guard                               |
| 41  | 09 04 114 | 1   | .Hose clip                                  |
|     | 71 14 289 | 1   | .Drive shaft assembly (not illustrated)     |

\* Items deleted from June 1983.

# ARMHEAD



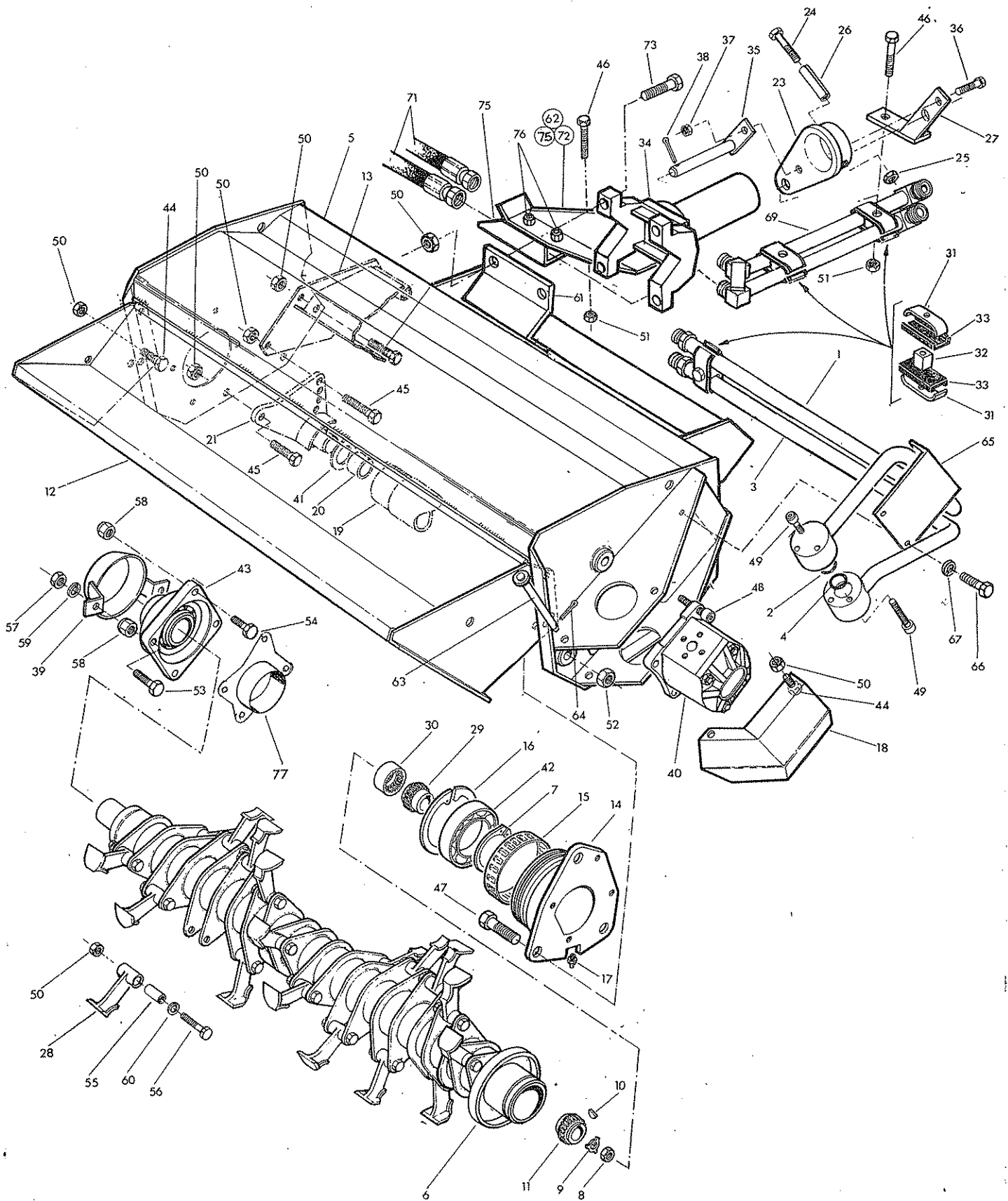
| Ref | Part No   | Qty | Description  |
|-----|-----------|-----|--|
|     | 71 14 350 |     | PA24 FLAIL HEDGETRIMMER continued                  |
| 1   | 71 14 264 | 1   | .Main arm c/w bushes, pins etc.                    |
| 2   | 71 14 161 | 2   | ..Bush   |
| 3   | 71 01 134 | 2   | ..Bush   |
| 4   | 71 09 062 | 1   | ..Reach ram rod end pin c/w split pin              |
| 5   | 05 03 126 | 1   | ...Split pin ¼" 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 55)                  |
| 15  | 71 15 338 | 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 and greaser               |
| 19  | 95 01 406 | 1   | ...Split pin Ø5 x 40                               |
| 20  | 71 14 080 | 1   | ..Angling ram base end pin c/w split pin & greaser |
| 21  | 09 01 121 | 1   | ...Greaser 1/8" BSP St                             |
| 22  | 05 03 126 | 1   | ...Split pin ¼" diameter x 1½" long                |
| 23  | 71 14 038 | 1   | .. Dipper arm pivot pin c/w split pin              |
| 24  | 05 03 166 | 1   | ...Split pin ¼" diameter x 2" long                 |
| 25  | 09 01 121 | 1   | ..Greaser 1/8" BSP St.                             |
| 26  | 71 11 342 | 1   | .Angling ram assembly (see page 56)                |
| 27  | 71 11 053 | 2   | .Radius arm c/w split pin                          |
| 28  | 95 01 406 | 1   | ..Split pin Ø5 x 40                                |
| 29  | 71 14 340 | 1   | .Slave link c/w bushes                             |
| 30  | 71 01 083 | 4   | ..Bush   |
| 31  | 71 14 262 | 1   | .Tension link c/w bushes                           |
| 32  | 72 14 060 | 2   | ..Bush   |
| 33  | 70 12 037 | 2   | ..Bush   |
| 34  | 71 14 044 | 6   | ..Hose clip upper (large)                          |
| 35  | 71 14 045 | 6   | .Hose clip lower (large)                           |
| 36  | 71 14 075 | 4   | .Hose clip upper (small)                           |
| 37  | 71 14 076 | 4   | .Hose clip lower (small)                           |
| 38  | 92 13 165 | 4   | .Hexagon bolt M10 x 80                             |
| 39  | 92 13 125 | 2   | .Hexagon bolt M10 x 60                             |
| 40  | 91 43 005 | 6   | .Self locking nut M10                              |



# HEDGE FLAIL HEAD with SLIDING OFFSET ( 1 METRE )

For two position fixed offset flail head refer to instruction supplement 141.

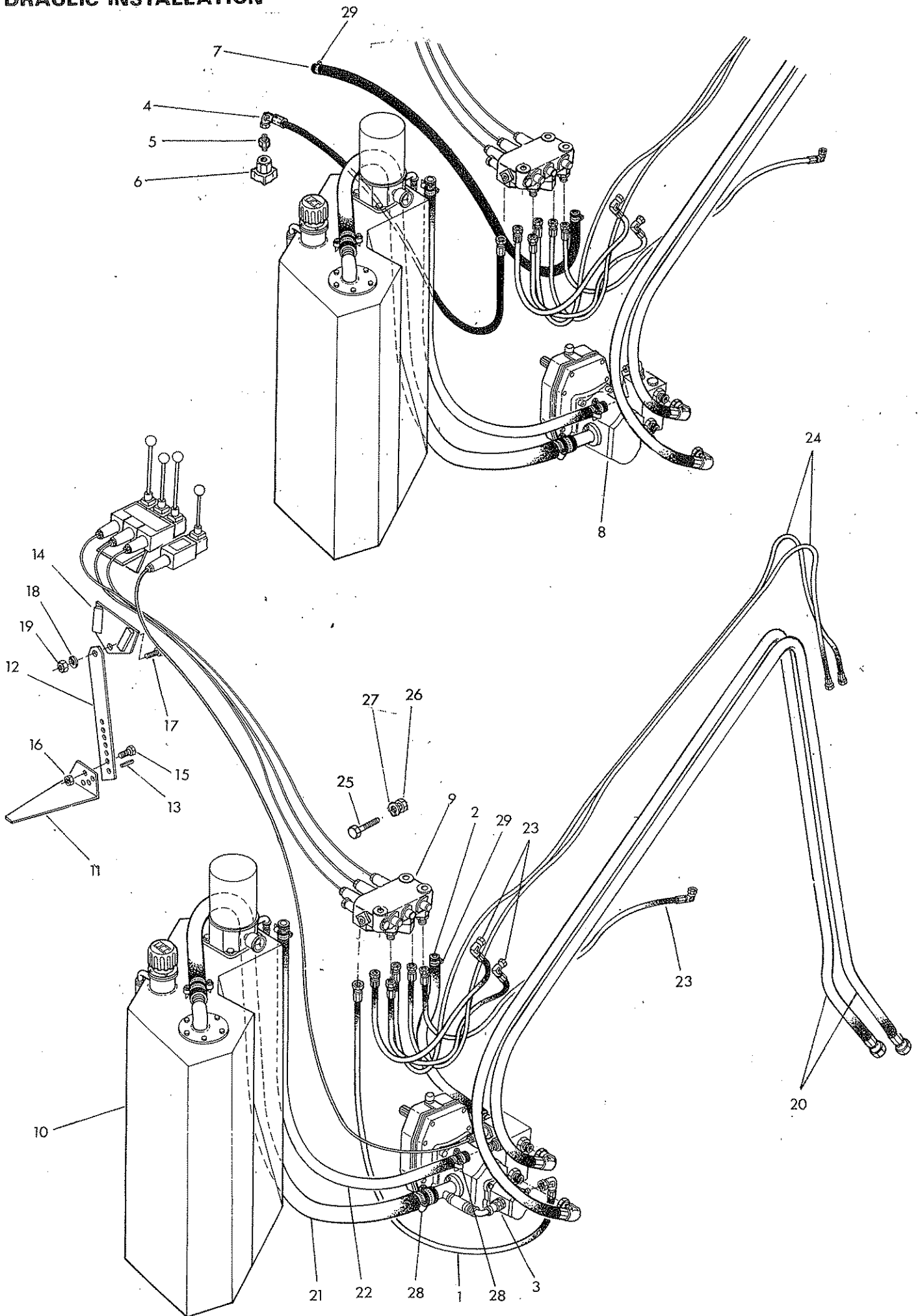
For central mounted flail head with integral forward extension, see page 58.



For 1.2 metre flail head see page 60

| Ref | Part No   | Qty | Description   |
|-----|-----------|-----|---|
|     | 71 14 392 |     | HEDGE FLAIL HEAD  |
| 1   | 71 14 415 | 1   | .Rigid pipe upper c/w '0' ring  |
| 2   | 86 00 121 | 1   | .. '0' ring   |
| 3   | 71 14 416 | 1   | .Rigid pipe lower c/w '0' ring  |
| 4   | 86 00 121 | 1   | .. '0' ring   |
| 5   | 71 14 401 | 1   | .Flail casing   |
| 6   | 71 14 330 | 1   | .Flail rotor c/w nut, washer, woodruff key & circlip & coupling half. |
| 7   | 04 01 290 | 1   | ..External circlip Ø90  |
| 8   | 91 00 015 | 1   | ..Hexagon nut M14   |
| 9   | 82 01 139 | 1   | ..Tab washer Ø 14   |
| 10  | 83 01 010 | 1   | ..Woodruff key  |
| 11  | 71 14 104 | 1   | ..Coupling half   |
| 12  | 71 14 300 | 1   | .Front hood   |
| 13  | 71 14 297 | 1   | .Rear hood  |
| 14  | 71 14 298 | 1   | .Bearing housing c/w tolerance ring circlip & greaser                 |
| 15  | 71 14 042 | 1   | ..Tolerance ring  |
| 16  | 71 14 043 | 1   | ..Internal circlip Ø 140  |
| 17  | 09 01 125 | 1   | ..Greaser 1/8" BSP - 45°  |
| 18  | 71 14 337 | 1   | .Motor cover  |
| 19  | 71 14 039 | 1   | .Roller c/w bushes  |
| 20  | 72 13 023 | 2   | ..Bush  |
| 21  | 71 11 090 | 1   | .Roller bracket R. Hand   |
| 22  | 71 11 091 | 1   | .Roller bracket L. Hand (not illustrated)                             |
| 23  | 71 14 109 | 1   | .Jaw plate c/w nut, bolt and spring dowel                             |
| 24  | 92 13 185 | 1   | ..Bolt M10 x 90   |
| 25  | 91 43 005 | 1   | ..'Clevelok' nut M10  |
| 26  | 04 23 548 | 1   | ..Spring dowel 5/8" dia x 3" long                                     |
| 27  | 71 14 100 | 1   | .Pipe mounting bracket  |
| 28  | 71 14 312 | 20  | .Flail F12 H  |
|     | 71 14 105 | 1   | .Coupling assembly comprising:-                                       |
| 29  | 71 14 104 | 2   | ..Drive coupling half   |
| 30  | 71 14 103 | 1   | ..Coupling sleeve   |
| 31  | 71 14 046 | 6   | .Rigid pipe clamp   |
| 32  | 71 14 048 | 3   | .Pipe spacer  |
| 33  | 71 14 047 | 6   | .Pipe clamp strip   |
| 34  | 71 14 417 | 1   | .Forward extension  |
| 35  | 71 14 099 | 1   | .Slave link pin c/w split pin, nut & bolt                             |
| 36  | 92 13 075 | 1   | ..Bolt M10 x 35   |
| 37  | 91 43 005 | 1   | ..'Clevelok' nut M10  |
| 38  | 95 01 406 | 1   | ..Split pin Ø 5 x 40  |
| 39  | 71 14 339 | 1   | .Bearing cover  |
| 40  | 83 01 260 | 1   | .Hydraulic motor  |
| 41  | 60 01 136 | 2   | .Thrust washer  |
| 42  | 06 00 043 | 1   | .Bearing (6018 - Z)   |
| 43  | 06 00 062 | 1   | .Flange bearing   |
| 44  | 03 11 085 | 6   | .Setscrew 1/2" UNF x 1" long  |
| 45  | 03 11 105 | 4   | .Setscrew 1/2" UNF x 1 1/4" long                                      |
| 46  | 92 13 135 | 3   | .Bolt M10 x 65  |
| 47  | 73 14 146 | 3   | .Special bolt M16 x 50  |
| 48  | 93 00 104 | 4   | ..'Wedglok' capscrew M10 x 40   |
| 49  | 93 00 014 | 6   | ..'Wedglok' capscrew M10 x 60   |
| 50  | 01 41 005 | 30  | ..'Clevelok' nut 1/2" UNF   |
| 51  | 91 43 005 | 4   | ..'Clevelok' nut M10  |
| 52  | 91 43 007 | 3   | ..'Clevelok' nut M16  |
| 53  | 02 11 186 | 2   | .Bolt 5/8" UNF x 2 1/4" long  |
| 54  | 03 11 126 | 2   | .Setscrew 5/8" UNF x 1 1/2" long                                      |
| 55  | 71 14 108 | 20  | .Flail pivot bush   |
| 56  | 71 14 082 | 20  | .Special bolt   |
| 57  | 01 31 006 | 2   | .Thin hexagon nut 5/8" UNF  |
| 58  | 01 41 006 | 4   | ..'Clevelok' nut 5/8" UNF   |
| 59  | 01 00 206 | 2   | .Spring washer 5/8" dia   |
| 60  | 01 00 205 | 22  | .Spring washer  |
| 61  | 71 14 151 | 1   | .Clamp plate  |
| 62  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long  |
| 63  | 71 14 049 | 1   | .Motor cover mounting pin c/w split pin                               |
| 64  | 05 03 095 | 1   | .Split pin 3/16" dia x 1 1/8" long                                    |
| 65  | 71 14 145 | 1   | .Pipe guard   |
| 66  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long  |
| 67  | 01 00 205 | 2   | .Spring washer 1/2" dia   |
| 68  | 73 14 399 | 1   | .Flail warning sticker not illustrated                                |
| 69  | 71 14 418 | 1   | .Rigid pipe assembly  |
| 70  | 71 14 145 | 1   | .Pipe guard   |
| 71  | 85 18 015 | 2   | .Hose 3/4" BSP M-M x 46" long   |
| 72  | 92 13 065 | 1   | .Bolt M10 x 30  |
| 73  | 02 11 145 | 4   | .Bolt 1/2" UNF x 1 1/2" long  |
| 74  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long  |
|     | 71 14 408 | 1   | .Hose protection cover assembly                                       |
| 75  | 71 14 420 | 1   | ..Pipe support bracket  |
| 75  | 71 14 423 | 1   | ..Hose guard c/w nuts & bolts   |
| 76  | 91 43 005 | 2   | ...Clevelok nut M10   |
| 77  | 71 14 464 | 1   | .Shroud ring  |
|     | 86 99 166 |     | SEAL KIT HYDRAULIC MOTOR  |

# HYDRAULIC INSTALLATION



| Ref | Part No.  | Qty | Description  |
|-----|-----------|-----|--|
|     | 80 17 311 |     | INDEPENDENT HYDRAULIC INSTALLATION                       |
| 1   | 85 31 303 | 1   | .Hose 3/8 BSP St-F 90° F x 42" long                      |
| 2   | 85 01 106 | 1   | .Hose 5/8" bore x 27" long                               |
| 3   | 80 13 343 | 1   | .Gearbox-pump-Rotor control valve assembly (see page 44) |
|     | 80 17 315 |     | TRACTOR SUPPLY HYDRAULIC INSTALLATION                    |
| 4   | 85 31 223 | 1   | .Hose 3/8" BSP S-F 90° F 59" long                        |
| 5   | 60 00 113 | 1   | .Union 3/8" BSP M-M                                      |
| 6   | 85 90 023 | 1   | .Self seal coupling-female half                          |
| 7   | 85 01 053 | 1   | .Hose 5/8" bore x 60" long                               |
| 8   | 80 13 347 | 1   | .Gearbox-pump-Rotor relief valve assembly (see page 50)  |

The following items are common to both hydraulic assemblies

|      |           |   |                                       |
|------|-----------|---|---------------------------------------|
| 9    | 81 30 257 | 1 | .Control assembly (see page 40)       |
| 10   | 71 14 270 | 1 | .Hydraulic oil tank (see page 52)     |
|      | 71 09 319 | 1 | .Universal socket and pillar compr:-  |
| 11   | 71 09 320 | 1 | ..Sandwich plate                      |
| 12   | 71 09 146 | 1 | ..Pillar c/w spring dowel             |
| 13   | 04 22 816 | 1 | ...Spring dowel                       |
| * 14 | 71 09 147 | 1 | ..Socket                              |
| 15   | 93 13 066 | 1 | ..Setscrew M12 x 30                   |
| 16   | 91 13 006 | 1 | ..Hexagon nut M12                     |
| 17   | 03 11 086 | 1 | ..Setscrew 5/8" UNF x 1" long         |
| 18   | 01 00 206 | 1 | ..Spring washer 5/8" diameter         |
| 19   | 01 11 006 | 1 | ..Hexagon nut 5/8" UNF                |
| 20   | 85 01 104 | 2 | .Hose 3/4" BSP St-F 90° F x 184" long |
| 21   | 85 01 105 | 1 | .Hose 1 1/4" bore x 59" long          |
| 22   | 85 00 842 | 1 | .Hose 1" bore x 42" long              |
| 23   | 85 35 022 | 3 | .Hose 1/4" BSP St-F 90° F x 48" long  |
| 24   | 85 35 032 | 2 | .Hose 1/4" BSP St-F 90° F x 153" long |
| 25   | 92 13 044 | 2 | .Bolt M8 x 20                         |
| 26   | 91 13 004 | 2 | .Hexagon nut M8                       |
| 27   | 91 00 204 | 2 | .Spring washer Ø 8                    |
| 28   | 09 04 106 | 8 | .Hose clip (1" and 1 1/4" bore hose)  |
| 29   | 09 04 204 | 2 | .Hose clip (5/8 bore hose)            |

\* Item deleted from August 1983.



| 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' 1/4 BSP - 3/8 BSP     |
| 24  | 85 81 145 | 1       | ..Restrictor Union 3/8" BSP - 1/4" 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' 1/4 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                       |
| 30  | 71 14 171 | 1       | .Valve mounting plate.                       |
| 31  | 92 13 124 | 3       | .Bolt M8 x 60                                |
| 32  | 91 13 004 | 3       | .Nut M8                                      |
| 33  | 91 00 204 | 3       | .Spring washer $\emptyset$ 8                 |
|     | 86 99 163 |         | SEAL KIT.                                    |

\* Mounting plate is integral with the 'T' frame on machines prior to August 1983.



| 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 $\varnothing 5 \times 40$          |
| 29  | 80 17 006 | 1   | .Mounting bracket - bolt on                      |

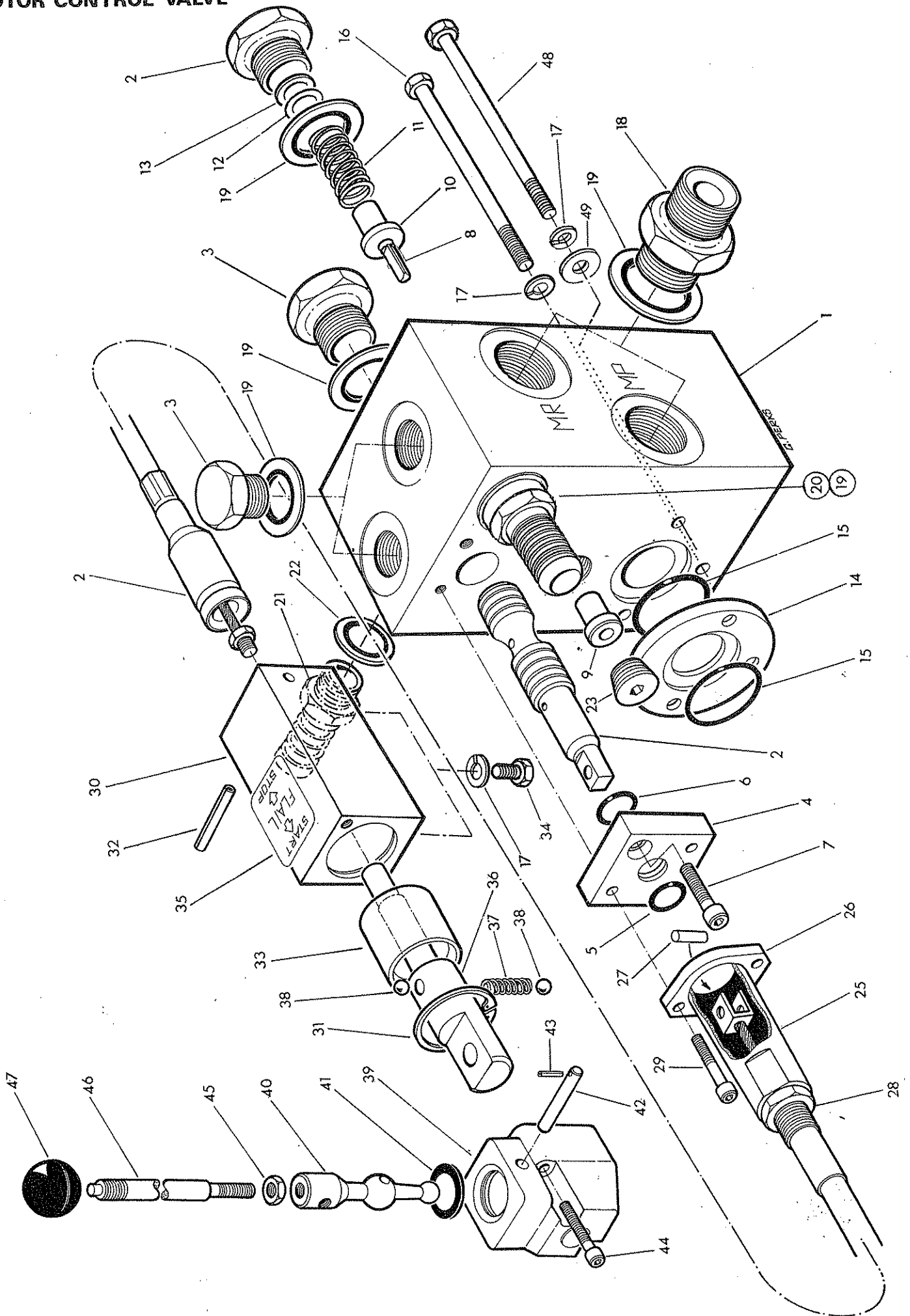
\* Wedge mounting bracket replaced by item 29 from August 1983.





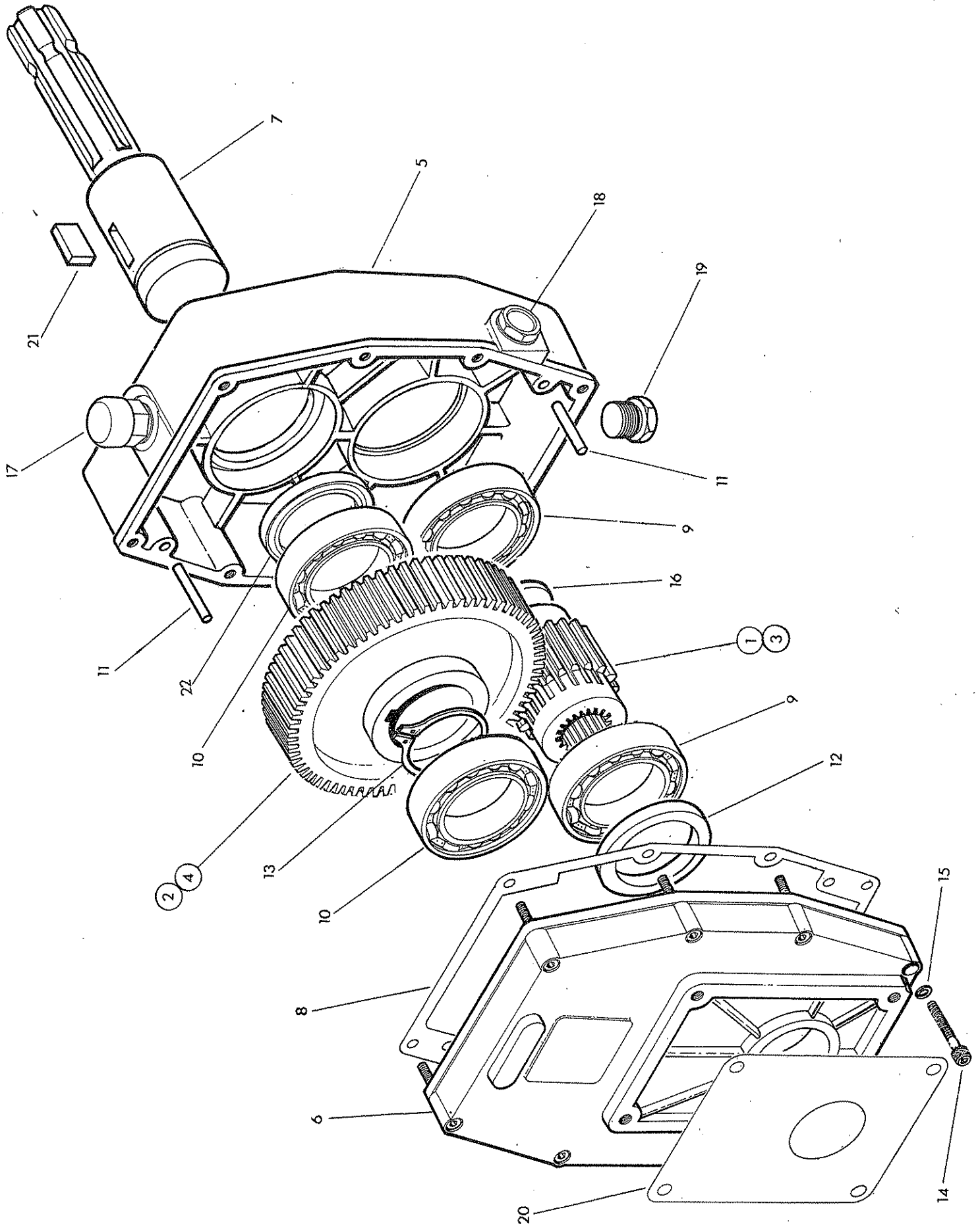
| Ref | Part No.  | Qty | Description                                       |
|-----|-----------|-----|---|
|     | 80 13 343 |     | GEARBOX/PUMP/ROTOR CONTROL VALVE ASSY             |
| 1   | 81 25 315 | 1   | .Rotor control valve (see page 46)                |
|     | 80 13 341 | 1   | .Gearbox pump assembly                            |
| 2   | 80 13 339 | 1   | ..Gearbox assembly (see page 48)                  |
| 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.)                          |

# ROTOR CONTROL VALVE



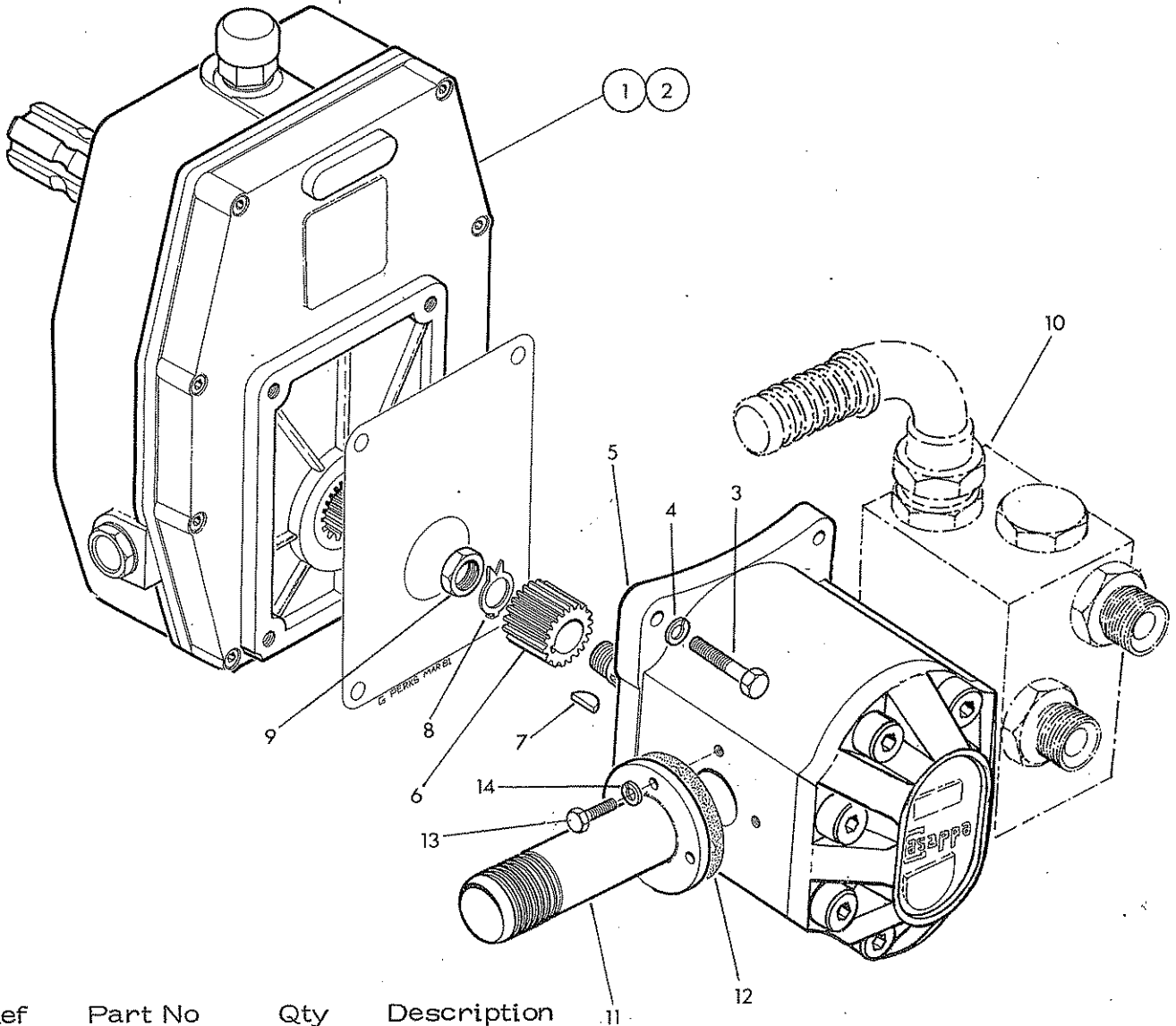
| Ref | Part No   | Qty      | Description                                     |
|-----|-----------|----------|---|
|     | 81 25 317 |          | ROTOR CONTROL VALVE                             |
| 1   | 81 25 067 | 1        | .Valve body c/w spool (not supplied separately) |
| 2   |           | 1        | Spool (reference only)                          |
| 3   | 81 25 031 | 4        | .Spool or Relief valve cap                      |
| 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 25 047 | 1        | .Spring register )                              |
| 10  | 81 25 048 | 1        | .Drill bush $\varnothing 5$                     |
| 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 |          | .Bolt M8 x 90                                   |
| 17  | 91 00 204 | 5        | .Spring washer $\varnothing 8$                  |
| 18  | 85 81 136 | 2        | .Union $\frac{3}{4}$ " BSP M-M                  |
| 19  | 86 50 106 | 7        | .Bonded seal $\frac{3}{4}$ " BSP                |
| 20  | 81 27 134 | 1        | .Return connection $\frac{3}{4}$ " BSP          |
| 21  | 81 25 008 | 1        | .Low pressure connection                        |
| 22  | 86 50 103 | 1        | .Bonded seal 3/8" BSP                           |
| 23  | 85 82 044 | 1        | .Taper plug $\frac{1}{2}$ " BSPT                |
| 24  | 81 25 046 | 1        | .Cable assembly c/w sleeve, flange, etc.        |
| 25  | 81 25 049 | 1        | ..Sleeve  |
| 26  | 81 25 050 | 1        | ..Flange  |
| 27  | 81 25 051 | 1        | ..Pin   |
| 28  | 91 00 016 | 1        | ..Thin locknut $\varnothing 16$ x 1.5 pitch     |
| 29  | 93 43 022 | 2        | .Capscrew M5 x 12                               |
| 30  | 71 14 069 | 1        | .Control block c/w spring dowel and circlip     |
| 31  | 04 11 118 | 1        | ..Internal circlip                              |
| 32  | 04 25 540 | 1        | ..Spring dowel $\varnothing 5$ x 40             |
| 33  | 71 14 067 | 1        | .Detent cage                                    |
| 34  | 93 13 034 | 2        | .Setscrew M8 x 16                               |
| 35  | 71 14 073 | 1        | .Instruction label                              |
| 36  | 71 14 070 | 1        | .Spindle  |
| 37  | 71 14 068 | 1        | .Spring   |
| 38  | 09 05 108 | 2        | .Steel ball $\frac{1}{4}$ " diameter            |
|     | 81 30 065 | 1        | .Lever pivot box assembly comprising:-          |
| 39  | 81 30 001 | 1        | ..Lever pivot box                               |
| 40  | 81 30 019 | 1        | ..Lever   |
| 41  | 81 30 013 | 1        | ..Lever seal ring                               |
| 42  | 81 30 009 | 1        | ..Lever pivot                                   |
| 43  | 81 30 021 | 1        | ..Spring dowel                                  |
| 44  | 93 43 072 | 2        | .Capscrew M5 x 35                               |
| 45  | 91 13 004 | 1        | .Thin hexagon nut M8                            |
| 46  | 71 14 072 | 1        | .Lever handle                                   |
| 47  | 09 03 121 | 1        | .Knob - black                                   |
| 48  | 92 13 204 | 2        | .Bolt M8 x 100                                  |
| 49  | 85 21 068 | 2        | .Special washer                                 |

# GEARBOX



| Ref | Part No.  | Qty<br>Home<br>Market | Qty<br>Export<br>Market | Description                        |
|-----|-----------|-----------------------|-------------------------|------------------------------------|
|     | 80 13 339 | 1                     |                         | GEARBOX ASSEMBLY BREVINI MP3       |
|     | 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 x 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                              |

# GEARBOX - PUMP - R.R. VALVE



| Ref | Part No   | Qty | Description                                    |
|-----|-----------|-----|--|
|     | 80 13 347 |     | GEARBOX-PUMP-ROTOR RELIEF VALVE                |
|     | 80 13 345 | 1   | .Assembly gearbox and pump                     |
| 1   | 80 13 339 | 1   | ..Gearbox assembly (see page 48 )              |
|     | 80 13 348 |     | GEARBOX-PUMP-ROTOR RELIEF VALVE (French build) |
|     | 80 13 346 | 1   | .Assembly gearbox and pump                     |
| 2   | 80 13 340 | 1   | ..Gearbox assembly (see page 48 )              |

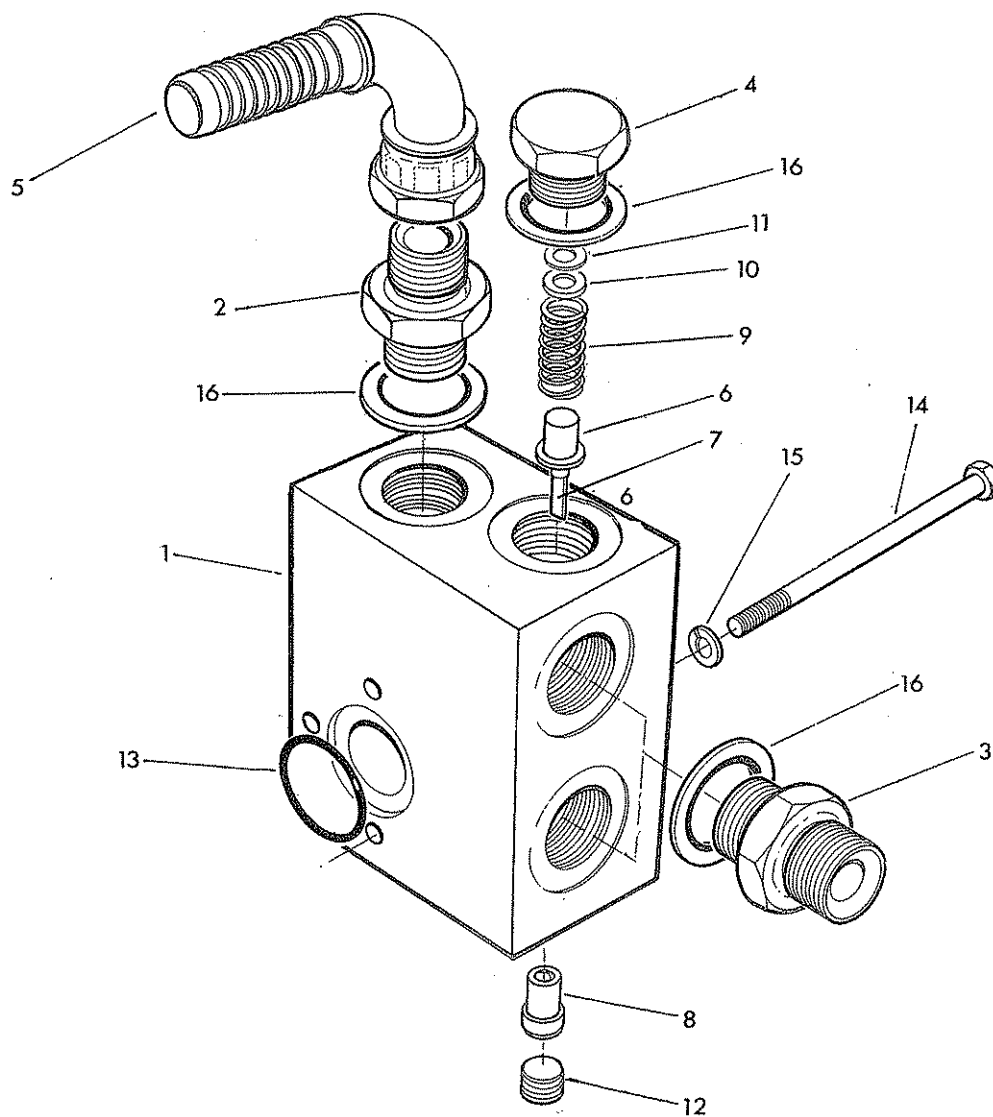
The following items are common to both Gearbox-pump-Rotor relief valve

|    |           |   |  |
|----|-----------|---|--|
| 3  | 92 13 095 | 4 | ..Bolt M10 x 45                            |
| 4  | 91 00 205 | 4 | ..Spring washer $\varnothing$ 10           |
| 5  | 82 01 457 | 1 | ..Pump assembly c/w washer, coupling etc.  |
| 6  | 80 13 057 | 1 | ...Pump drive coupling                     |
| 7  | 83 01 010 | 1 | ...Woodruff key                            |
| 8  | 82 01 039 | 1 | ...Tab washer                              |
| 9  | 91 00 015 | 1 | ...Thin hexagon nut                        |
| 10 | 81 25 320 | 1 | .Rotor relief valve assembly (see page 51) |
| 11 | 71 14 310 | 1 | .Flanged union                             |
| 12 | 80 13 023 | 1 | .Union gasket                              |
| 13 | 93 13 044 | 4 | .Set screw M8 x 20                         |
| 14 | 91 00 204 | 4 | .Spring washer $\varnothing$ 8             |

86 99 166  
86 29 133

PUMP SEAL KIT  
.Shaft Seal (not illustrated)

# ROTOR RELIEF VALVE



| Ref | Part No   | Qty      | Description                  |
|-----|-----------|----------|------------------------------|
|     | 81 25 320 |          | ROTOR RELIEF VALVE           |
| 1   | 81 25 321 | 1        | .Valve body                  |
| 2   | 80 02 086 | 1        | .Union 1" BSP - 3/4" BSP M-M |
| 3   | 85 81 136 | 2        | .Union 3/4" BSP M-M          |
| 4   | 81 25 058 | 1        | .Relief Valve cap            |
| 5   | 71 14 005 | 1        | .90° elbow 1" BSP            |
| 6   | 81 25 047 | 1        | .Spring register             |
| 7   | 81 25 042 | 1        | .Relief valve needle         |
| * 8 | 81 25 048 | 1        | .Drill bush Ø5               |
| 9   | 81 10 003 | 1        | .Spring                      |
| 10  | 01 00 102 | As req'd | .5/16" dia bright washer     |
| 11  | 60 01 232 | " "      | .0.4" shim washer            |
| 12  | 85 82 043 | 1        | .Taper plug 3/8" BSPT        |
| 13  | 86 00 119 | 1        | . 'O' ring                   |
| 14  | 92 13 124 | 3        | .Bolt M8 x 60                |
| 15  | 91 00 204 | 3        | .Spring washer Ø8            |
| 16  | 86 50 106 | 4        | .Bonded seal 3/4" BSP        |

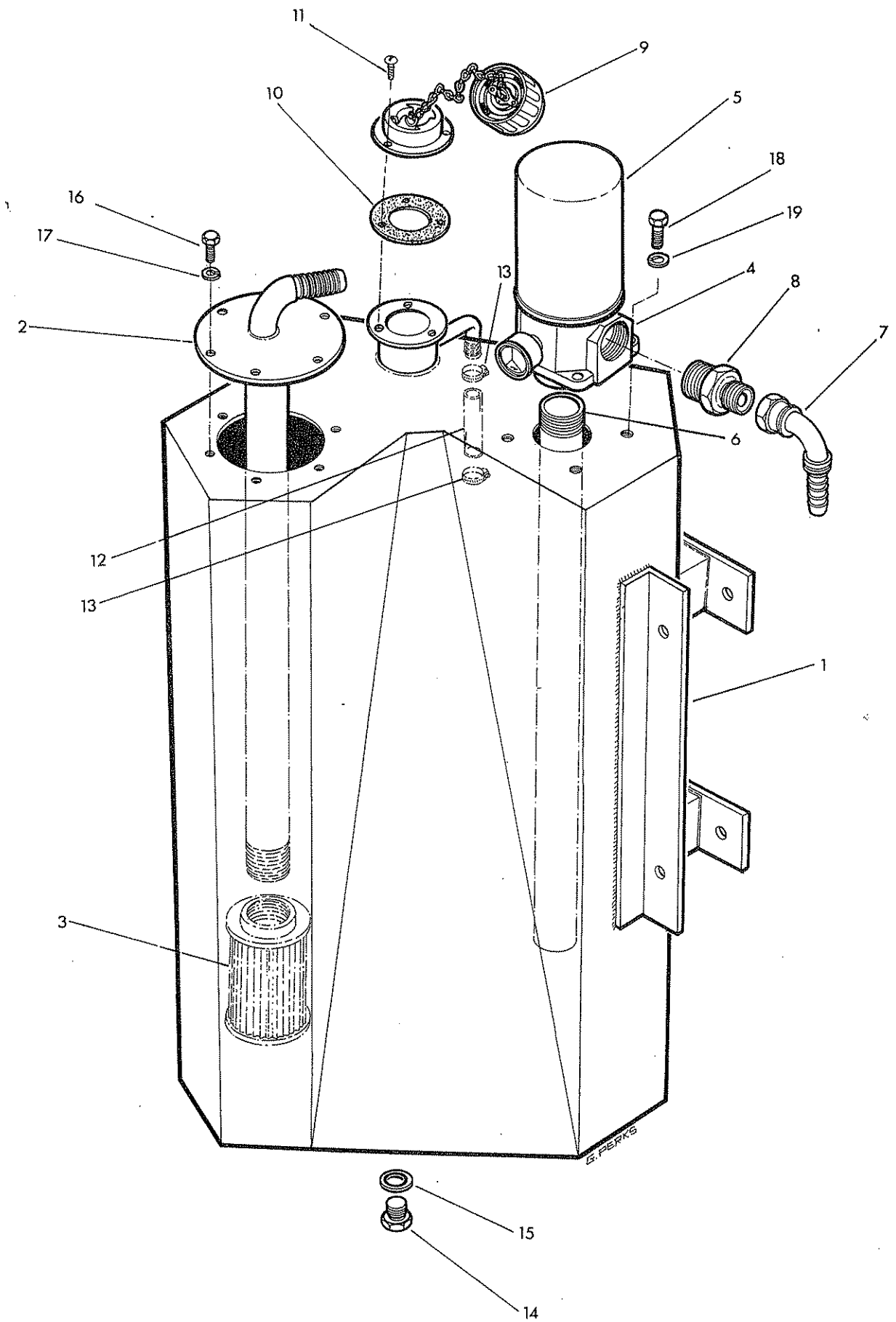
} supplied assembled

\* Assembly note:-

Drill bush secured in position using 'Loctite' 115



# OIL TANK

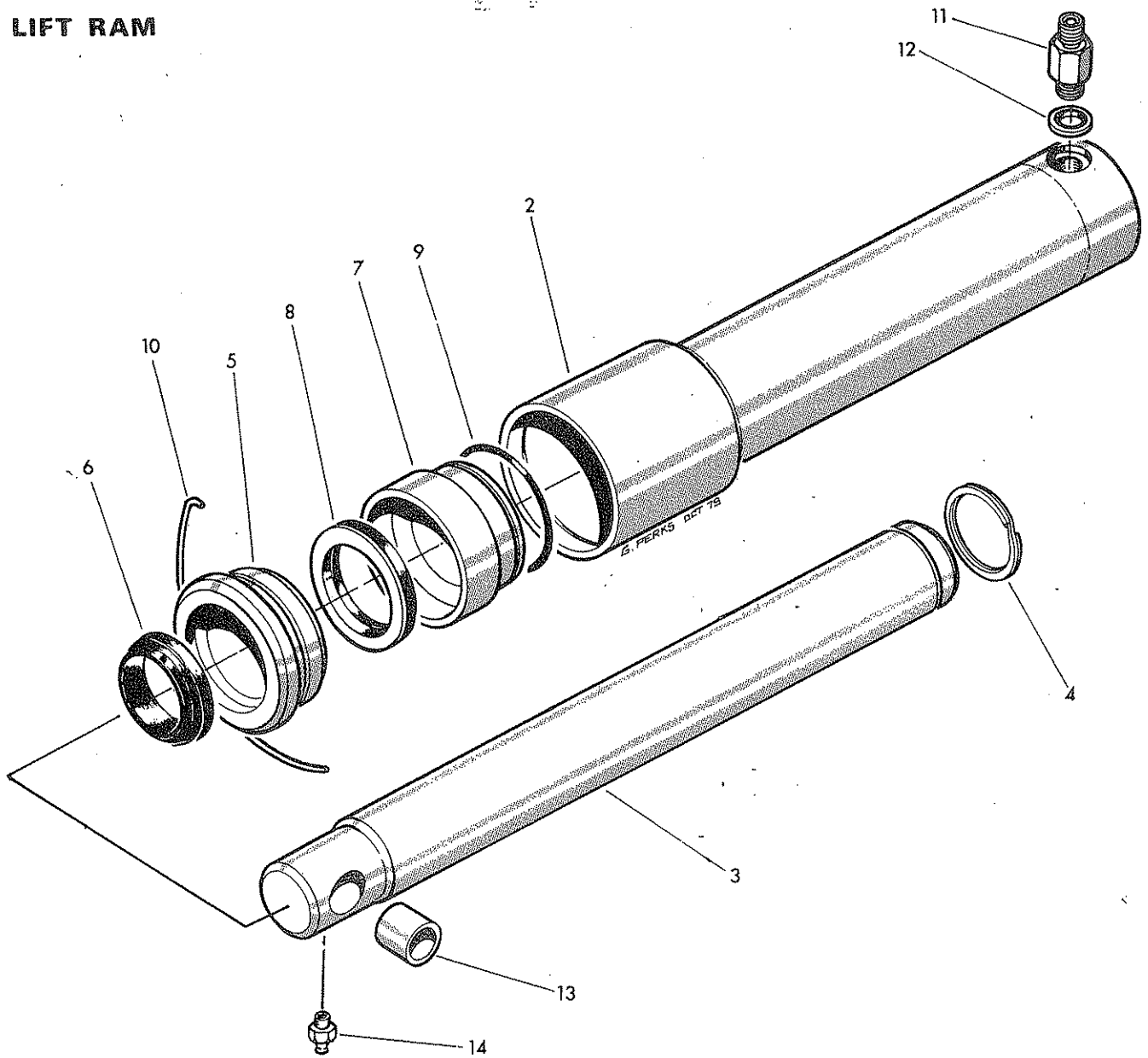


| Ref | Part No.  | Qty | Description                                     |
|-----|-----------|-----|---|
|     | 71 14 270 |     | HYDRAULIC OIL TANK ASSEMBLY                     |
| * 1 | 71 14 271 | 1   | .Oil tank                                       |
|     | 71 14 272 | 1   | .Suction element 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

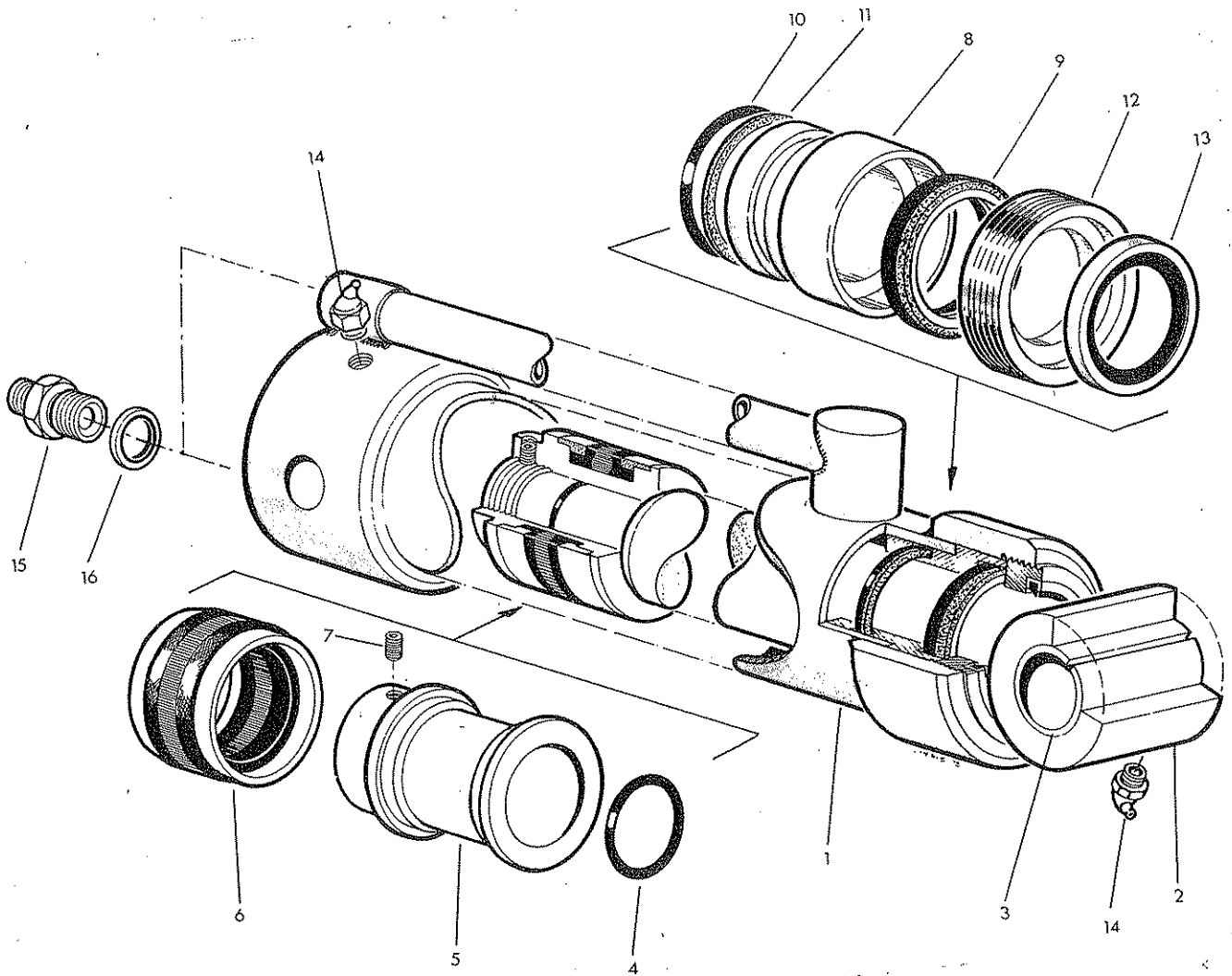
# LIFT RAM



| 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   | ... '0' 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



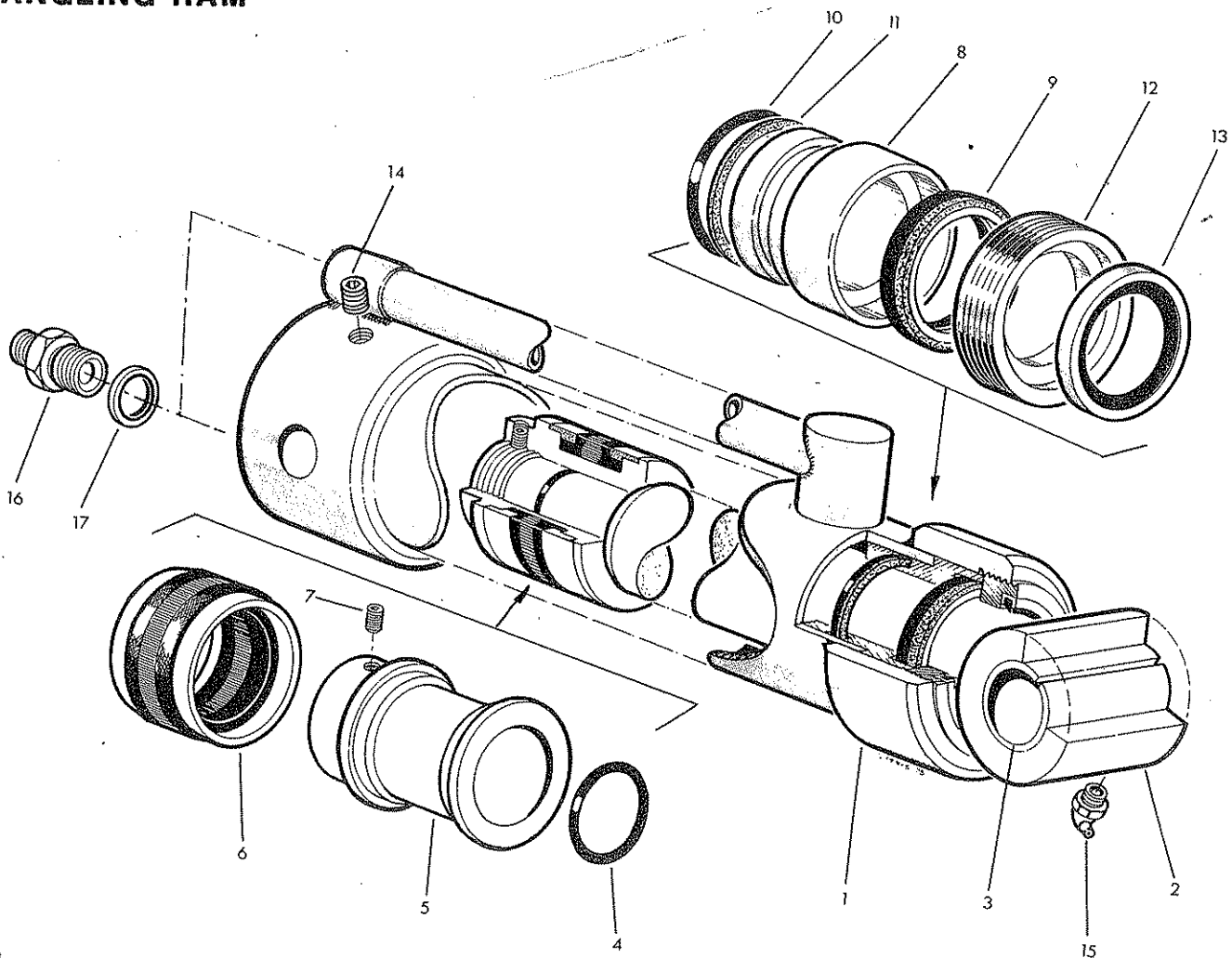
| Ref | Part No.  | Qty. | Description   |
|-----|-----------|------|---|
|     | 71 11 283 |      | REACH RAM ASSEMBLY                                      |
|     | 71 11 316 | 1    | .Basic ram assembly                                     |
| 1   | 71 03 304 | 1    | ..Ram cylinder  |
| 2   | 71 01 095 | 1    | ..Piston rod c/w bush and 'O' ring.                     |
| 3   | 71 05 050 | 1    | ...Bush   |
| 4   | 86 00 119 | 1    | ... 'O' ring.   |
| 5   | 71 01 165 | 1    | ..Piston c/w seal and grub screw                        |
| 6   | 86 36 131 | 1    | ...Piston seal.   |
| 7   | 93 00 110 | 1    | ...Grub screw M6 x 8                                    |
| 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 1/8 BSP angular 67 $\frac{1}{2}$ <sup>o</sup> |
| 15  | 85 81 145 | 2    | .Union 3/8 BSP - 1/4 BSP MM                             |
| 16  | 86 50 103 | 2    | .Bonded seal 3/8 BSP                                    |

86 99 102

SEAL KIT

SS

# ANGLING RAM

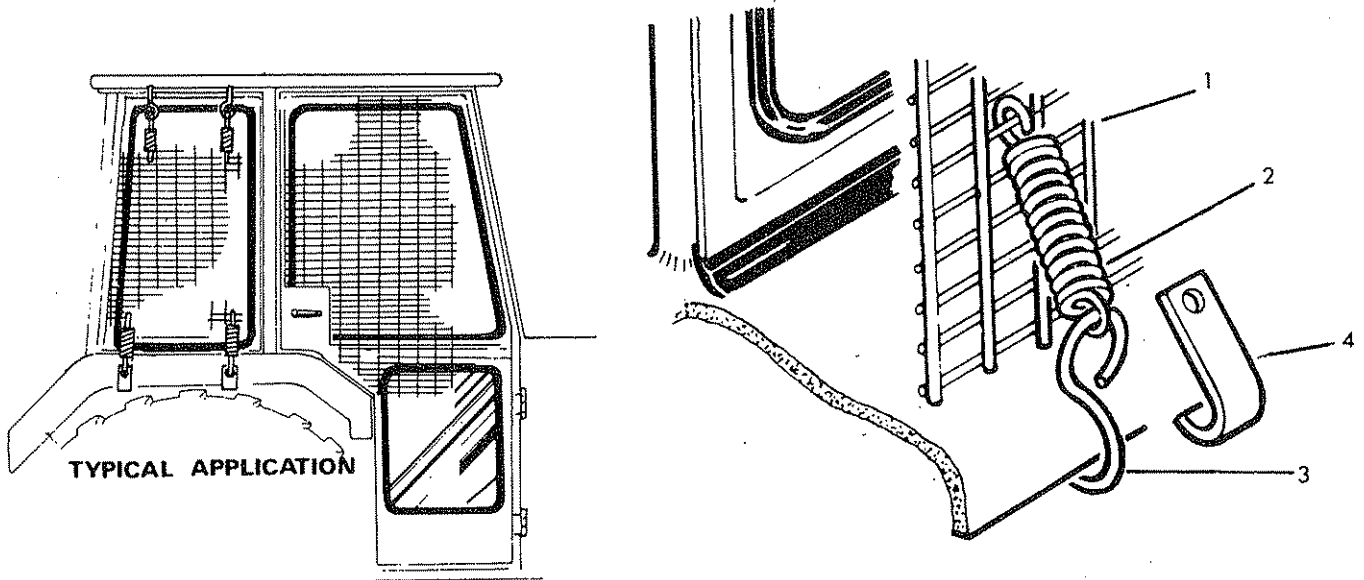


| Ref | Part No.  | Qty. | Description                            |
|-----|-----------|------|--|
|     | 71 11 342 |      | ANGLING RAM ASSEMBLY                   |
|     | 71 11 316 | 1    | ..Basic ram assembly                   |
| 1   | 71 03 304 | 1    | ..Ram cylinder                         |
| 2   | 71 01 095 | 1    | ..Piston rod c/w bush and 'O' ring.    |
| 3   | 71 05 050 | 1    | ...Bush                                |
| 4   | 86 00 119 | 1    | ... 'O' ring.                          |
| 5   | 71 01 165 | 1    | ..Piston c/w seal and grub screw.      |
| 6   | 86 36 131 | 1    | ...Piston seal.                        |
| 7   | 93 00 110 | 1    | ...Grub screw M6 x 8                   |
| 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  | 85 82 041 | 1    | ..Taper plug 1/8" BSPT                 |
| 15  | 09 01 124 | 1    | ..Greaser 1/8 BSP - angular 67 1/2°    |
| 16  | 85 81 145 | 2    | ..Union 3/8 BSP - 1/4 BSP M-M          |
| 17  | 86 50 103 | 2    | ..Bonded seal 3/8 BSP                  |

86 99 102

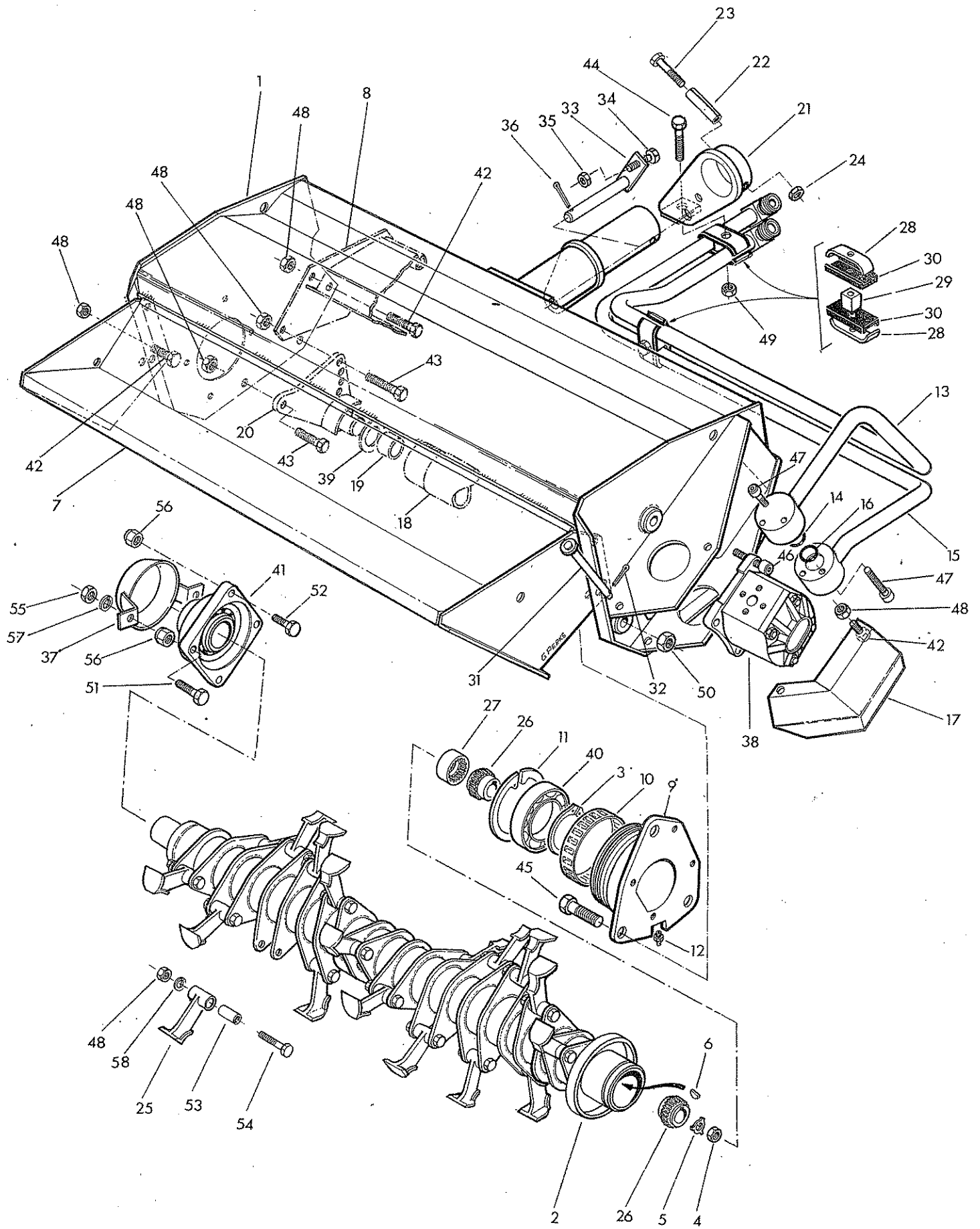
SEAL KIT

**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                      |

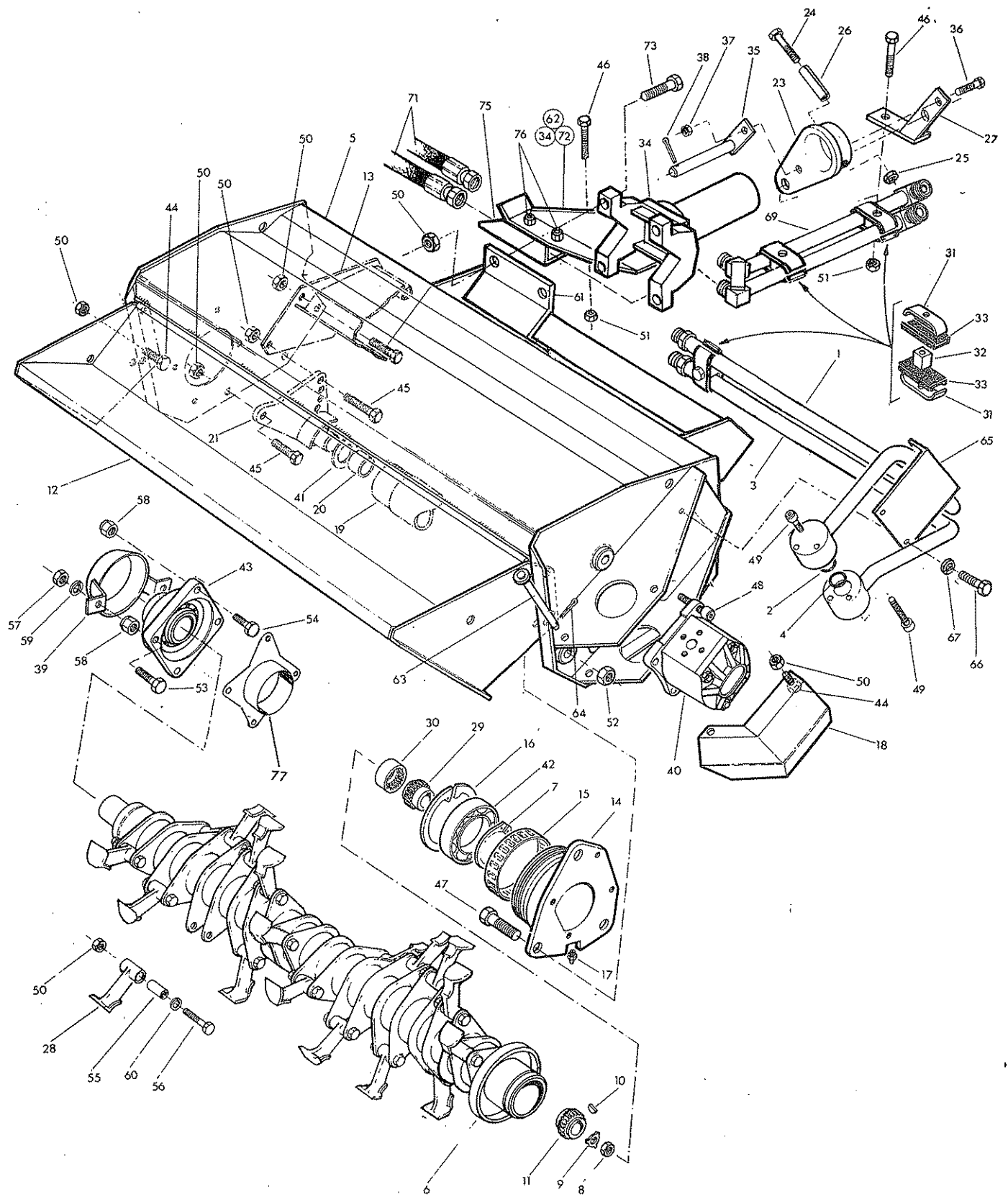
# FLAIL HEAD 1 metre with integral forward extension



| Ref | Part No   | Qty | Description  |
|-----|-----------|-----|--|
|     | 71 14 316 |     | PA24 FLAIL HEAD  |
| 1   | 71 14 315 |     | .Flail casing  |
| 2   | 71 14 330 | 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 x90   |
| 24  | 91 43 005 | 1   | ..'Clevelok' nut M10                                   |
| 25  | 71 14 312 | 20  | .Flail   |
|     | 71 14 105 | 1   | .Coupling assembly comprising:-                        |
| 26  | 71 14 104 | 2   | ..Drive coupling half                                  |
| 27  | 71 14 103 | 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 14 099 | 1   | .Slave link pin c/w split pin nut & screw              |
| 34  | 92 13 075 | 1   | ..Bolt M10 x 35  |
| 35  | 91 43 005 | 1   | ..'Clevelok' M10                                       |
| 36  | 95 01 406 | 1   | ..Split pin $\varnothing 5$ x 40                       |
| 37  | 71 14 339 | 1   | .Bearing cover   |
| 38  | 83 01 260 | 1   | .Hydraulic motor                                       |
| 39  | 60 01 136 | 2   | .Thrust washer   |
| 40  | 06 00 043 | 1   | .Bearing (6018-Z)                                      |
| 41  | 06 00 062 | 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  | 92 13 135 | 2   | .Bolt M10 x 65   |
| 45  | 73 14 146 | 3   | .Special bolt M16 x 50                                 |
| 46  | 93 00 104 | 4   | .'Wedglok' capscrew M10 x 40                           |
| 47  | 93 00 014 | 6   | .'Wedglok' capscrew M10 x 60                           |
| 48  | 01 41 005 | 30  | .'Clevelok' nut 1/2" UNF                               |
| 49  | 91 43 005 | 2   | .'Clevelok' nut M10                                    |
| 50  | 91 00 001 | 3   | .'Conelok' nut M16                                     |
| 51  | 02 11 186 | 2   | .Bolt 5/8 UNF x 2 1/4 long                             |
| 52  | 03 11 146 | 2   | .Setscrew 5/8" UNF x 1 3/4" long                       |
| 53  | 71 14 108 | 20  | .Flail pivot bush                                      |
| 54  | 71 14 082 | 20  | .Special bolt  |
| 55  | 01 31 006 | 2   | .Thin hexagon nut 5/8 UNF                              |
| 56  | 01 41 006 | 4   | .'Clevelok' nut 5/8 UNF                                |
| 57  | 01 00 206 | 2   | .Spring washer 5/8" diameter                           |
| 58  | 01 00 205 | 20  | .Spring washer 1/2" diameter                           |
|     | 86 99 166 |     | SEAL KIT Hydraulic motor                               |



# 1:2 METRE HEDGE FLAIL HEAD WITH SLIDING OFFSET



| Ref | Part No   | Qty | Description  |
|-----|-----------|-----|--|
|     | 71 14 454 |     | HEDGE FLAIL HEAD   |
| 1   | 71 14 415 | 1   | .Rigid pipe upper c/w '0' ring   |
| 2   | 86 00 121 | 1   | .. '0' ring  |
| 3   | 71 14 416 | 1   | .Rigid pipe lower c/w '0' ring   |
| 4   | 86 00 121 | 1   | .. '0' ring  |
| 5   | 71 14 407 | 1   | .Flail casing  |
| 6   | 71 14 331 | 1   | .Flail rotor c/w nut, washer, woodruff key & circlip<br>& coupling half. |
| 7   | 04 01 290 | 1   | .. External circlip $\varnothing$ 90                                     |
| 8   | 91 00 015 | 1   | .. Hexagon nut M14   |
| 9   | 82 01 139 | 1   | .. Tab washer $\varnothing$ 14   |
| 10  | 83 01 010 | 1   | .. Woodruff key  |
| 11  | 71 14 104 | 1   | .. Coupling half   |
| 12  | 71 14 335 | 1   | .Front hood  |
| 13  | 71 14 336 | 1   | .Rear hood   |
| 14  | 71 14 298 | 1   | .Bearing housing c/w tolerance ring circlip & greaser                    |
| 15  | 71 14 042 | 1   | .. Tolerance ring  |
| 16  | 71 14 043 | 1   | .. Internal circlip $\varnothing$ 140                                    |
| 17  | 09 01 125 | 1   | .. Greaser 1/8" BSP - 45°  |
| 18  | 71 14 299 | 1   | .Motor cover   |
| 19  | 71 14 098 | 1   | .Roller c/w bushes   |
| 20  | 72 13 023 | 2   | .. Bush  |
| 21  | 71 11 090 | 1   | .Roller bracket R. Hand  |
| 22  | 71 11 091 | 1   | .Roller bracket L. Hand (not illustrated)                                |
| 23  | 71 14 109 | 1   | .Jaw plate c/w nut, bolt and spring dowel                                |
| 24  | 92 13 185 | 1   | .. Bolt M10 x 90   |
| 25  | 91 43 005 | 1   | .. 'Clevelok' nut M10  |
| 26  | 04 23 548 | 1   | .. Spring dowel 5/8" dia x 3" long                                       |
| 27  | 71 14 100 | 1   | .Pipe mounting bracket   |
| 28  | 71 14 312 | 24  | .Flail F12 H   |
|     | 71 14 105 | 1   | .Coupling assembly comprising:-  |
| 29  | 71 14 104 | 2   | .. Drive coupling half   |
| 30  | 71 14 103 | 1   | .. Coupling sleeve   |
| 31  | 71 14 046 | 6   | .Rigid pipe clamp  |
| 32  | 71 14 048 | 3   | .Pipe spacer   |
| 33  | 71 14 047 | 6   | .Pipe clamp strip  |
| 34  | 71 14 417 | 1   | .Forward extension   |
| 35  | 71 14 099 | 1   | .Slave link pin c/w split pin, nut & bolt                                |
| 36  | 92 13 075 | 1   | .. Bolt M10 x 35   |
| 37  | 91 43 005 | 1   | .. 'Clevelok' nut M10  |
| 38  | 95 01 406 | 1   | .. Split pin $\varnothing$ 5 x 40  |
| 39  | 71 14 339 | 1   | .Bearing cover   |
| 40  | 83 01 260 | 1   | .Hydraulic motor   |
| 41  | 60 01 136 | 2   | .Thrust washer   |
| 42  | 06 00 043 | 1   | .Bearing (6018 - Z)  |
| 43  | 06 00 062 | 1   | .Flange bearing  |
| 44  | 03 11 085 | 6   | .Setscrew 1/2" UNF x 1" long   |
| 45  | 03 11 105 | 4   | .Setscrew 1/2" UNF x 1 1/4" long   |
| 46  | 92 13 135 | 3   | .Bolt M10 x 65   |
| 47  | 73 14 146 | 3   | .Special bolt M16 x 50   |
| 48  | 93 00 104 | 4   | .. 'Wedglok' capscrew M10 x 40   |
| 49  | 93 00 014 | 6   | .. 'Wedglok' capscrew M10 x 60   |
| 50  | 01 41 005 | 34  | .. 'Clevelok' nut 1/2" UNF   |
| 51  | 91 43 005 | 4   | .. 'Clevelok' nut M10  |
| 52  | 91 43 007 | 3   | .. 'Clevelok' nut M16  |
| 53  | 02 11 186 | 2   | .Bolt 5/8" UNF x 2 1/2" long   |
| 54  | 03 11 126 | 2   | .Setscrew 5/8" UNF x 1 1/2" long   |
| 55  | 71 14 108 | 24  | .Flail pivot bush  |
| 56  | 71 14 082 | 24  | .Special bolt  |
| 57  | 01 31 006 | 2   | .Thin hexagon nut 5/8" UNF   |
| 58  | 01 41 006 | 4   | .. 'Clevelok' nut 5/8" UNF   |
| 59  | 01 00 206 | 2   | .Spring washer 5/8" dia  |
| 60  | 01 00 205 | 26  | .Spring washer   |
| 61  | 71 14 151 | 1   | .Clamp plate   |
| 62  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long   |
| 63  | 71 14 049 | 1   | .Motor cover mounting pin c/w split pin                                  |
| 64  | 05 03 095 | 1   | .Split pin 3/16" dia x 1 1/8" long                                       |
| 65  | 71 14 145 | 1   | .Pipe guard  |
| 66  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long   |
| 67  | 01 00 205 | 2   | .Spring washer 1/2" dia  |
| 68  | 73 14 399 | 1   | .Flail warning sticker not illustrated                                   |
| 69  | 71 14 418 | 1   | .Rigid pipe assembly   |
| 70  | 71 14 145 | 1   | .Pipe guard  |
| 71  | 85 18 015 | 2   | .Hose 3/4" BSP M=M x 46" long  |
| 72  | 92 13 065 | 1   | .Bolt M10 x 30   |
| 73  | 02 11 145 | 4   | .Bolt 1/2" UNF x 1 1/4" long   |
| 74  | 03 11 065 | 2   | .Setscrew 1/2" UNF x 3/4" long   |
|     | 71 14 408 | 1   | .Hose protection cover assembly  |
| 74  | 71 14 420 | 1   | .. Pipe support bracket  |
| 75  | 71 14 423 | 1   | .. Hose guard c/w nuts & bolts   |
| 76  | 91 43 005 | 2   | .. 'Clevelok' nut M10  |
| 77  | 71 14 464 | 1   | .Shroud ring   |
|     | 86 99 166 |     | SEAL KIT HYDRAULIC MOTOR   |





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