

PA. 22

Operation & Spare parts 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 McConnell Service Department for assistance.

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

DEFINITIONS

The following definitions apply throughout this manual:

WARNING

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

CAUTION

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

NOTE

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

Left and Right-Hand

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

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

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

SAFETY PRECAUTIONS

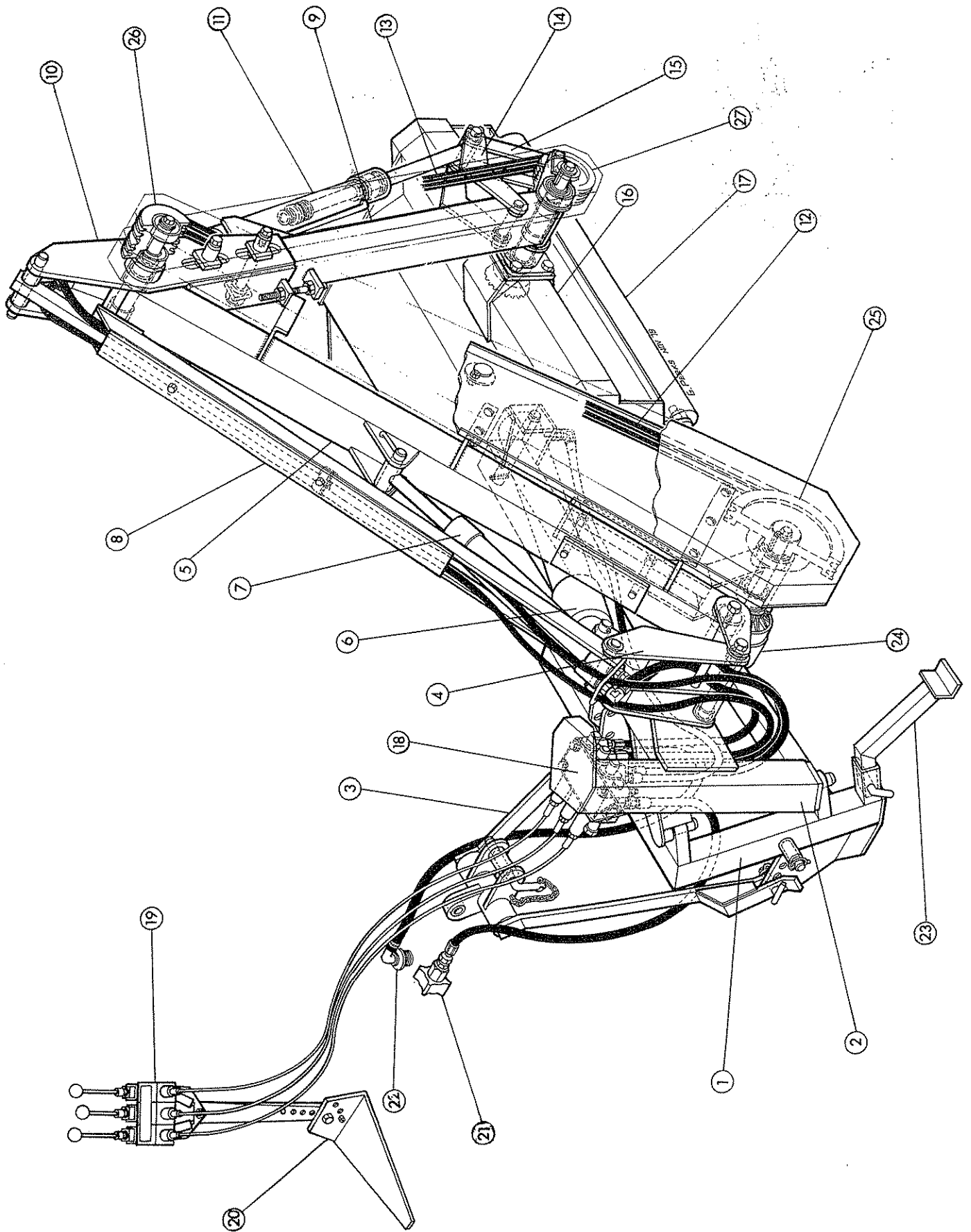


WARNING

- 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 540 rpm on the pto shaft.
- ... stop the engine with the pto engaged.
- ... operate the machine without a cab safety guard.
-
- ALWAYS ... ensure that belt guards and pto guard are firmly secured in place before operating the machine.
- ... carefully 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 22 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



SECTION 1

1. Introduction

The Power Arm 22 is a belt-driven 3-point linkage mounted flail hedge trimmer. It has been designed for lighter hedges and maintenance work and will fit the great majority of tractors without any extra brackets or fittings etc. The tractor's hydraulic system provides power to move the machine's arms, and the tractor's pto shaft supplies the power to operate the flail head. The machine is equipped with its own in-built stand and the minimum of effort is required for fast hitching on and off the tractor.

The hydraulic control valve which is mounted directly on the machine is cable operated from a lever assembly that is mounted within the cab adjacent to the tractor seat.

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.

2. General arrangement

Key to opposite page.

- | | |
|---------------------------|-------------------------------|
| 1. Main frame | 15. Slave link |
| 2. Tee frame | 16. Flail head |
| 3. Stabilizer yoke | 17. Roller |
| 4. Rocker | 18. Hydraulic control valve |
| 5. Main arm | 19. Control levers |
| 6. Lift ram | 20. Control lever mounting |
| 7. Reach ram | 21. Tractor supply coupling |
| 8. Parallel link | 22. Tractor return connection |
| 9. Dipper arm | 23. Stand leg |
| 10. Dipper arm carrier | 24. PTO drive shaft |
| 11. Angling ram | 25. Primary drive pulley |
| 12. Primary drive belts | 26. Intermediate pulley |
| 13. Secondary drive belts | 27. Final drive pulley |
| 14. Radius arm | |

3. Tractor Selection

The Power Arm 22 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.

Do not use a tractor on which it is necessary to engage the p.t.o. shaft to obtain hydraulic power e.g. certain early models of Nuffield and Fordson Major. The act of folding the machine to the transport position with the flail still rotating could be extremely dangerous.

4. Oil Supply

The PA22 is normally supplied as suitable for working with tractors that operate with an open-centre hydraulic system. Power for the movement of the armhead is obtained from the integral tractor hydraulic pump. The main relief valve of the armhead control valve is set at 1800 psi (126 Bar) therefore the tractors pressure 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 10 gpm should not have any adverse affect to the 'inching' response that is sometimes required from the control valve.

On all tractors other than John Deere, where a double-acting external service spool valve is provided, this service should be used and connected to the Power Arm 22 through the tractor's own hydraulic coupling.

The return through the tractors 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 manufacturer's instructions.

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

5. John Deere

The hydraulic systems of all models of John Deere operate on a closed-centre principle which makes it necessary for the PA22 to be operated by a closed-centre control valve. A McConnel flow metering valve is not required.

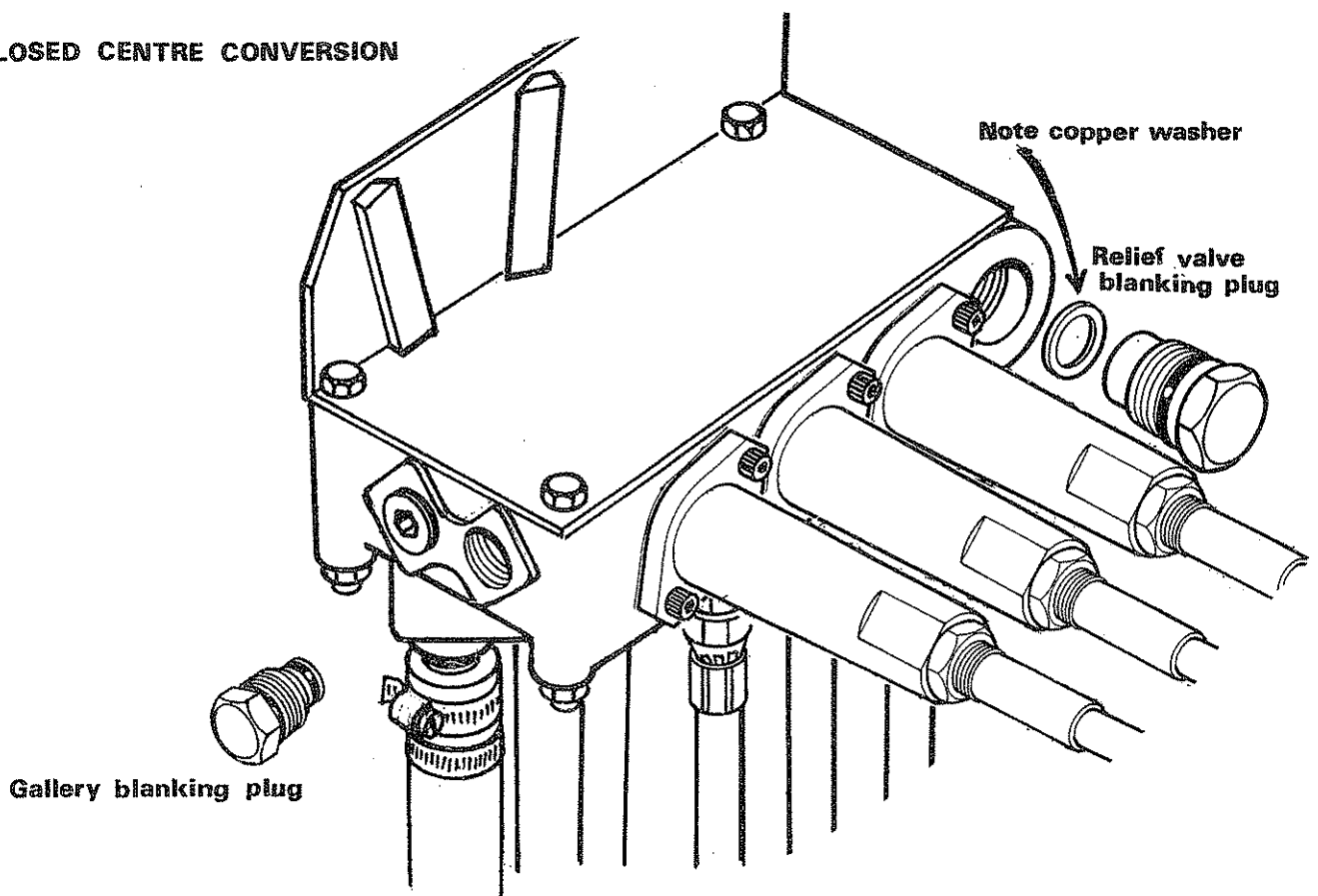
Oil is taken from one of the tractor's auxiliary service ports to the Valvoil control valve on the machine and returned to the tractor via the transmission filler plug.

Components are available from F.W.McConnel Ltd to convert a standard open-centre valve to a closed-centre for John Deere operation.

The kit part no. 81 30 059 consists of a relief valve blanking plug which should be installed in place of the main relief valve, and a pressure gallery blanking plug which is installed in place of the standard blanking plug which is fitted to the valve outlet end.

Note: Up to machine serial number 01BD21, it is not possible to convert the valve for closed-centre operation. The valve must be returned to Ludlow for exchange.

CLOSED CENTRE CONVERSION



6. Linkage Isolation

Although it may be possible to operate the PA22 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.

7. 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.

8. Check Chains/Stabilizer Bars

These should be employed to hold the machine firmly in a central position once the machine is attached to the tractor.

9. 'Floating' Type Drop Links

Certain tractors, particularly the International Harvester range have an adjustment on the drop arms that enables them to be used in a 'floating' position. This adjustment is secured by a roll pin, with an 'R' spring clip through it. Ensure that this assembly is firmly in place as the drop links are subject to compressive loads when the PA22 is mounted.

If the assembly is lost or if in any doubt, fit a high tensile steel bolt right through the link to secure it.

10. Ballast Weight

Irrespective of the size of the tractor, it must be stable whilst operating the PA22 under all conditions. Due regard must be paid to operating on slopes, and front end ballast as well as rear wheel weights should be added as appropriate to counter-balance the overhang of the flail head.

In addition rear wheel track should be as wide as practicable to increase stability on sideland ground.

Section II

FITTING AND REMOVAL INSTRUCTIONS

1. Fitting operator guard

The PA22 is supplied with an operator guard kit part number 73 13 324 which must be fitted to the tractor before commencing work.

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

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

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

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

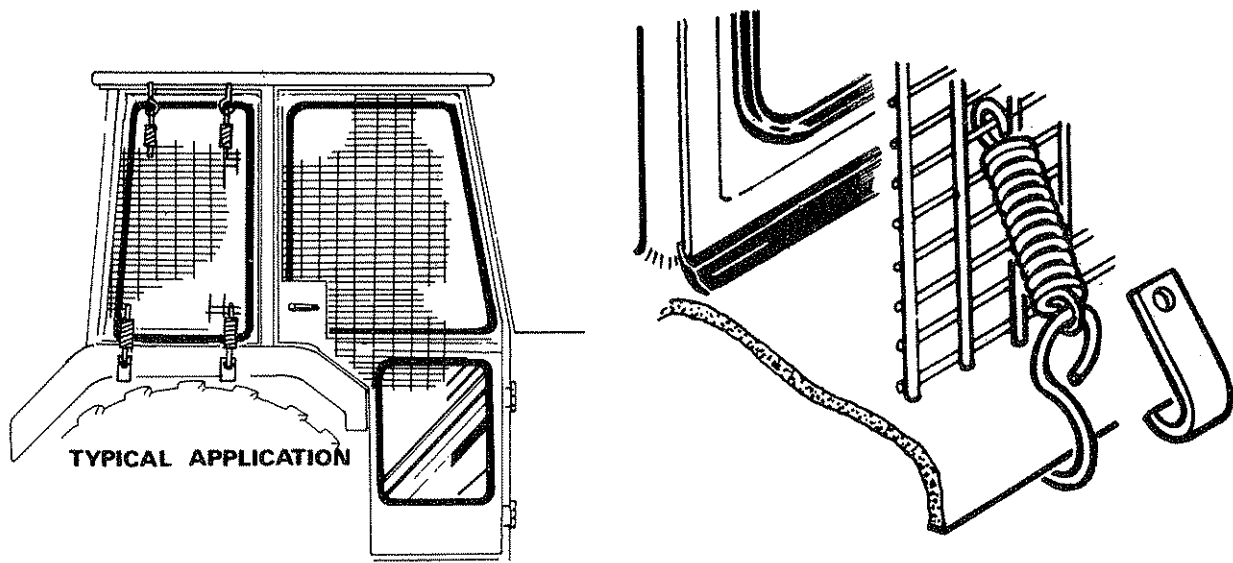
Polycarbonate transparent sheeting is an impact resistant material which can be readily sawn and shaped to requirements. To prevent damage to the surface a toughened grade of Polycarbonate which is resistant to scratching is recommended.

Polycarbonate sheeting is obtainable under brand names such as :-

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

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

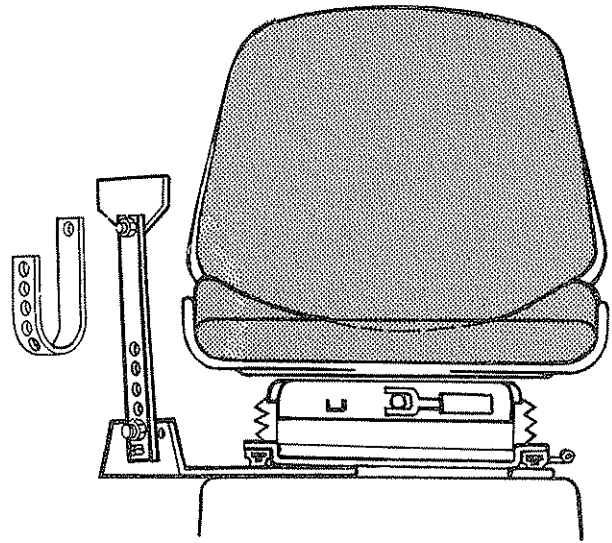
CAB GUARD



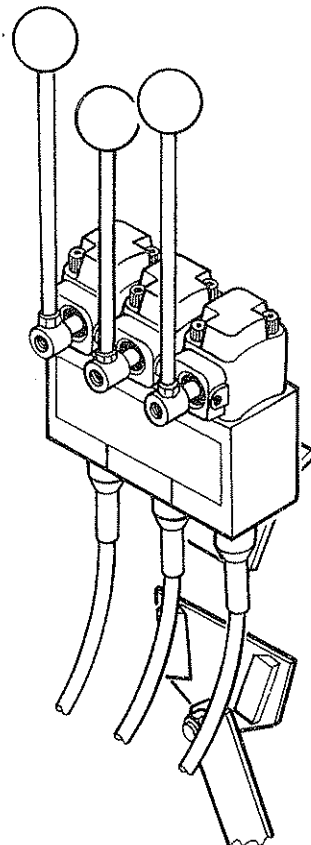
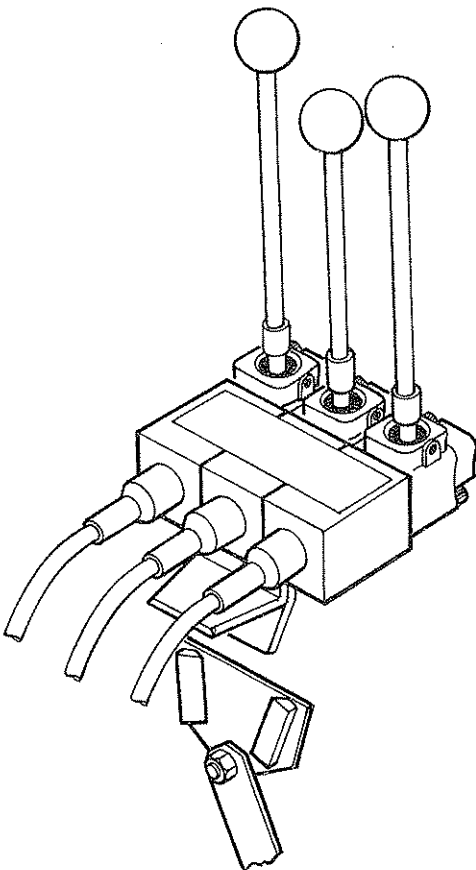
2. Fitting of control unit in cab.

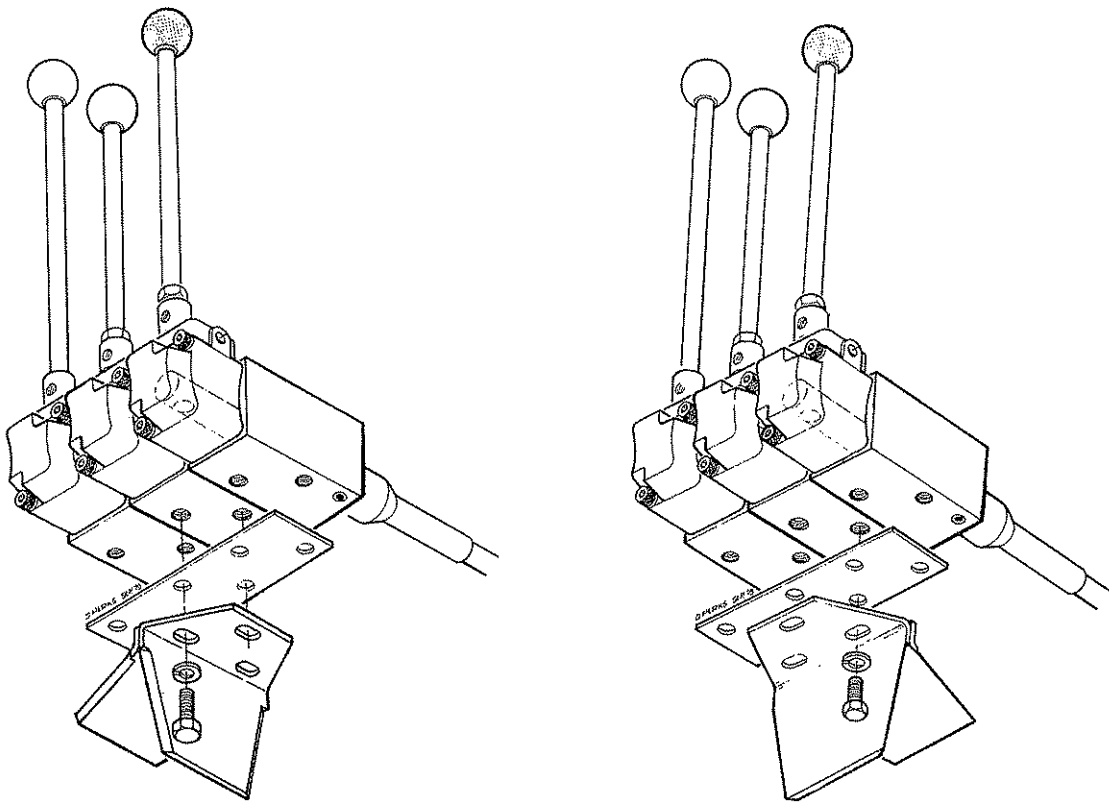
The control box is mounted on an adjustable stalk that is attached to a seat bracket which is of universal design for mounting in many models of tractor. The bracket is normally trapped between the seat runners and their mounting base. It may sometimes be necessary to drill extra holes in the seat bracket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

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



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





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

3. Machine attachment

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

- i) Adjust tractor drop arms to enable the draft links to lower within 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 lugs for the top link are uppermost.
- v) Install top link between yoke and upper hitch position on machine. If necessary, fitting Category 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.
- vii) Lower quadrant lever so that machine's weight is taken by the tractor.
- viii) Fit the return connection and hose and then the supply via the self-seal coupling.
- ix) Release the control lever assembly from its parking spigot on the main frame and pass through rear window or access aperture in cab. Relocate on its operating spigot alongside the tractor seat.
- x) Install PTO drive shaft on tractor ensuring that the collar locking pin is fully engaged. Wrap the torque chain around the tractor drawbar or other suitable point to prevent the guard from rotating.
- xi) Adjust the top link to bring the main arm upright and use the levelling box on the tractor drop arm to bring the main frame horizontal. This position should be further checked when the weight of the armhead is taken on the frame.
- xii) Tighten up check chains or adjustable stabilizers to hold the machine rigidly without sidesway.
- xiii) Remove parking feet, turn through 180° and relocate in their housings.
- xiv) Select tractor hydraulic external service and raise armhead using the lift lever on the control valve.

CAUTION when fitting PTO Drive Shaft.

If the machine is being fitted to an alternative tractor for the first time it is most important that the shaft length is carefully checked so that :-

- a) In the working position the two halves don't 'bottom out'. There should be a minimum of ½" clearance.
- b) In the transport position and when the main arm is at the uppermost limit of its travel in the 'breakaway' position there is still adequate engagement of the two halves of the shaft. Recommended 4" minimum.

Serious damage to the PTO drive shaft and/or tractor stub shaft will result from attempting to operate with incorrect lengths.

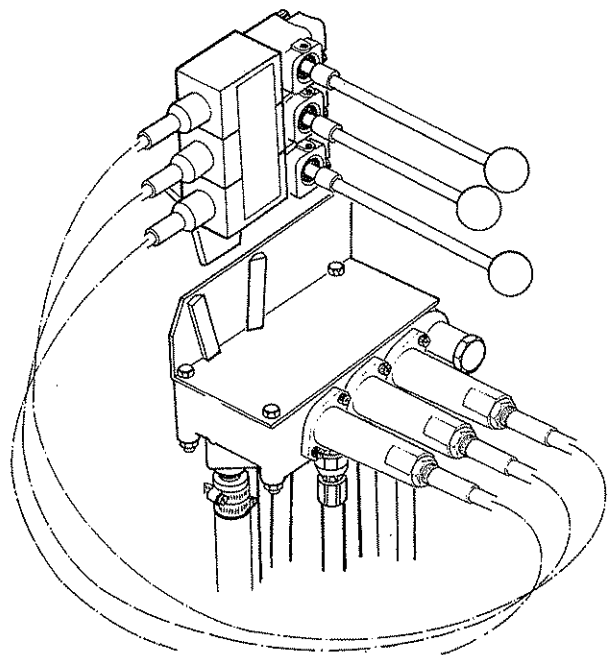
4. Machine removal

- i) Select a firm level site for parking the machine.
- ii) Extend the reach ram to place the flail head flat upon the ground about 2 – 3 feet away from the tractor's rear wheel, i.e. with about 8 – 10" of the ram rod exposed.
- iii) Disconnect stabilizer bars or loosen off check chains as applicable.
- iv) Remove parking legs, turn through 180° and replace and secure them in their housings.
- v) Disconnect and remove PTO shaft from tractor.
- vi) 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.

- vii) 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 ensure the flail head remains flat on the ground.
- viii) 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.

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



- x) Disconnect the hydraulic supply and return hoses.
- xi) Remove lower draft links from machine.
- xii) Drive tractor forward and then remove the yoke.

Note: Suitably enclose the hydraulic supply and return hose ends in a plastic bag to avoid contamination with dirt, and if the 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 should be wiped off before the machine is put back into operation.

Section 3

OPERATION

1. Limitations

The Power Arm 22 has been designed as a lightweight 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 cuts upwards with a brushing effect on the hedge. Heavily overgrown or badly neglected hedges should be tackled with a shapersaw or possibly a heavy duty type of flail head.

2. Highway working

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

3. Operator guard

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

4. Preparation

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

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

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

CAUTION:

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

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

5. Engaging drive

Select external service on tractor supply to allow oil to flow to the machine's control valve. Bring tractor engine speed to high idle before engaging the PTO. This will reduce the starting load imposed on the V belts and the rotor.

6. Operating speed

After engaging the drive increase engine revolutions to give an approximate speed of 400–420 rpm on the pto shaft. This is the recommended working speed and will give about 2000–2200 rpm at the rotor. Maximum working speed should not exceed 450 rpm on the pto shaft.

Under no circumstances whatever should a speed of 540 rpm be exceeded. 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 will also allow better control of the tractor and reduce the tendency for the operator to 'ride the clutch pedal'.

7. Forward speed

Tractor ground speed is determined by common sense and experience. The forward gear selected should be slow enough to allow the flails sufficient time to cut the work without overloading. It is obviously better to make a second pass or more in heavier growth to avoid undue strain. Overloading of the rotor will cause the belts to slip and they could rapidly burn out as a result. Belt slip can be heard as a distinct whirring noise and will be accompanied by slowing down of the rotor.

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.

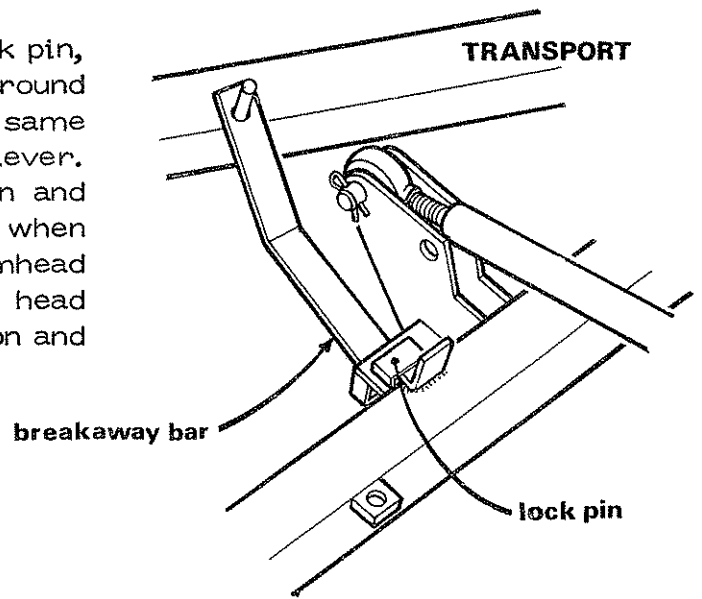
11. Breakaway action

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.

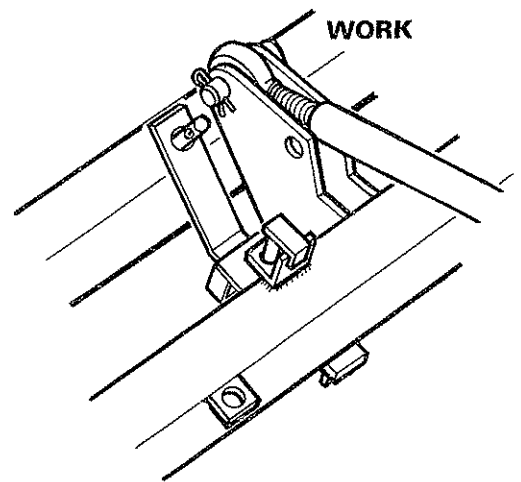
12. Transport position

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 flat upon 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 armhead should then be raised and the flail head angled inboard to a vertical position and rested on top of the main frame.

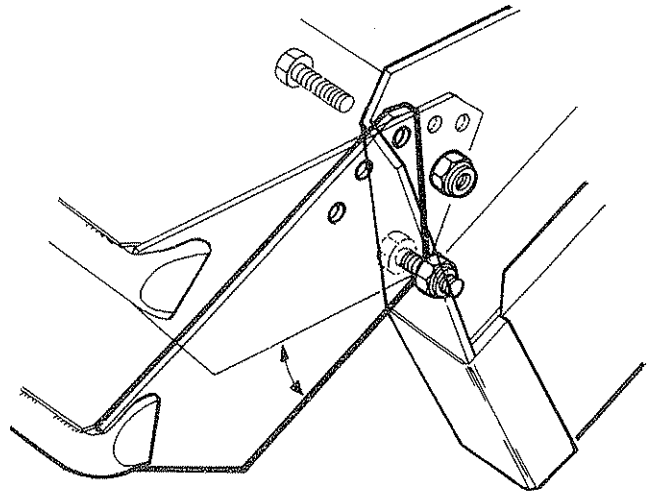


To revert back to the working position it is only necessary to place the flail head firmly on the ground, drive the tractor forward sufficiently to take the weight off the breakaway bar, when the lock pin can then be raised and turned so that its head is held against the protruding lug on the frame.



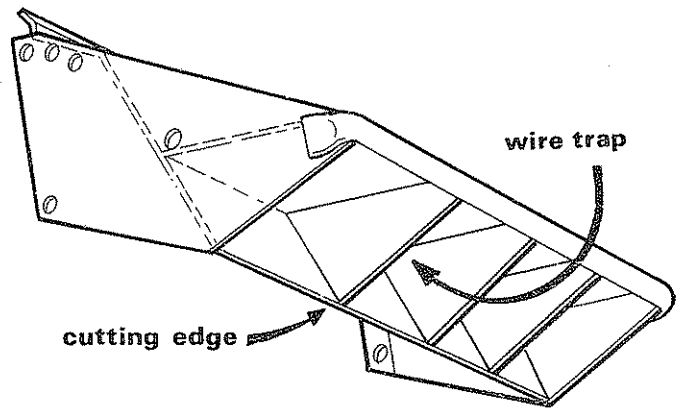
13. Flail hood

The flail hood is hinged at the front and provision is made for adjustment 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 hood is fully raised, larger growth can pass underneath, but with the greater tendency for material to be thrown.



14. Wire trap

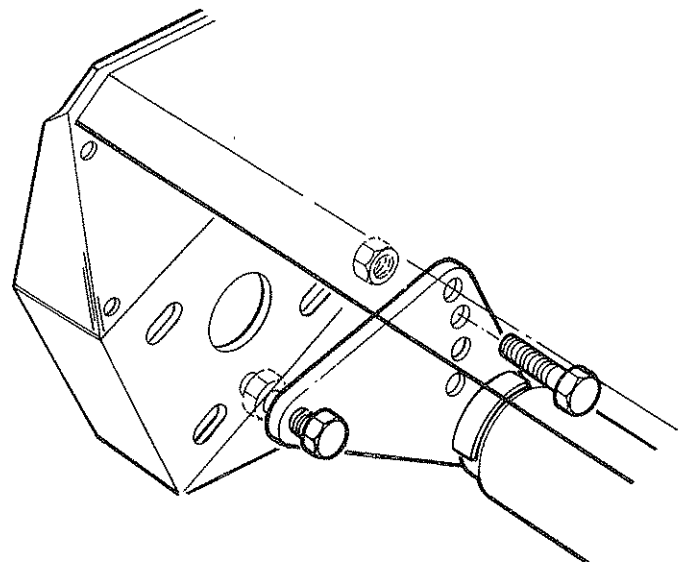
The flail hood is additionally equipped with a wire trap which consists of a steel plate welded across the underside. Any loose ends of a wire which are picked up and carried round by the rotor are cut by the edge of the metal plate and fall harmlessly to the ground. This plate should not be interfered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

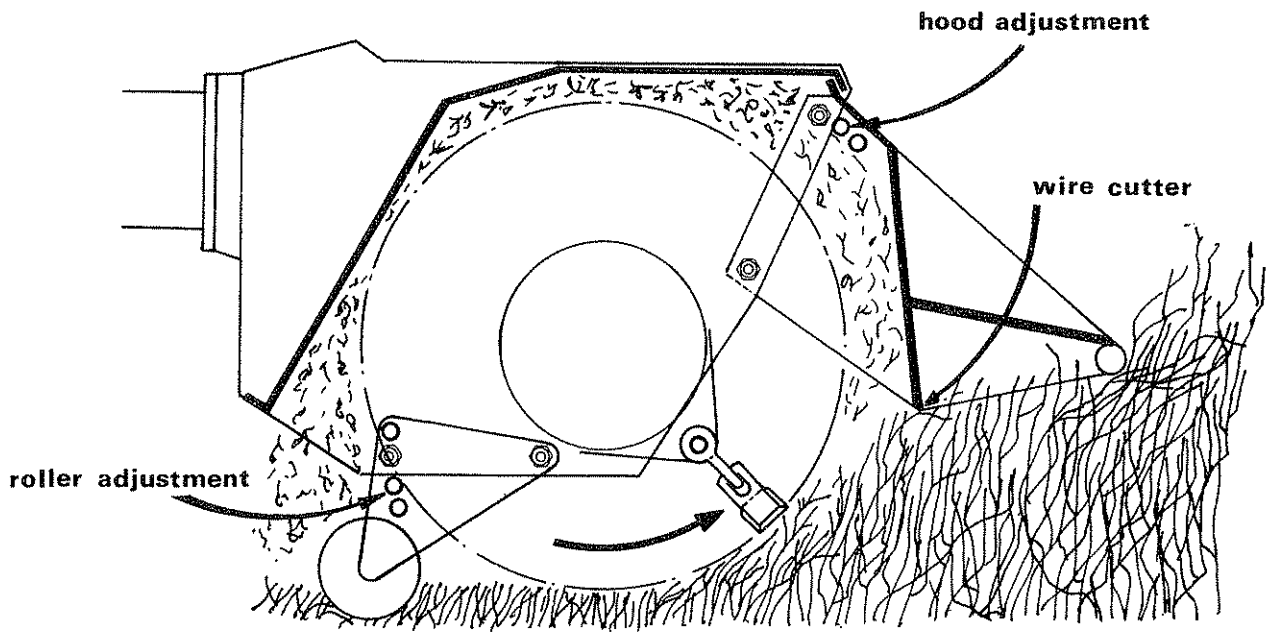


Further more, this wire trap does not relieve the operator of the responsibility of checking and cleaning the flail when it is suspected that wire has caught in the rotor.

15. 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.





Diagrammatic view of flail head

Never operate the flail head without the roller in position as it shields the flails and reduces the chances of long lengths of cut material and debris being thrown.

WARNING

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

Section 4

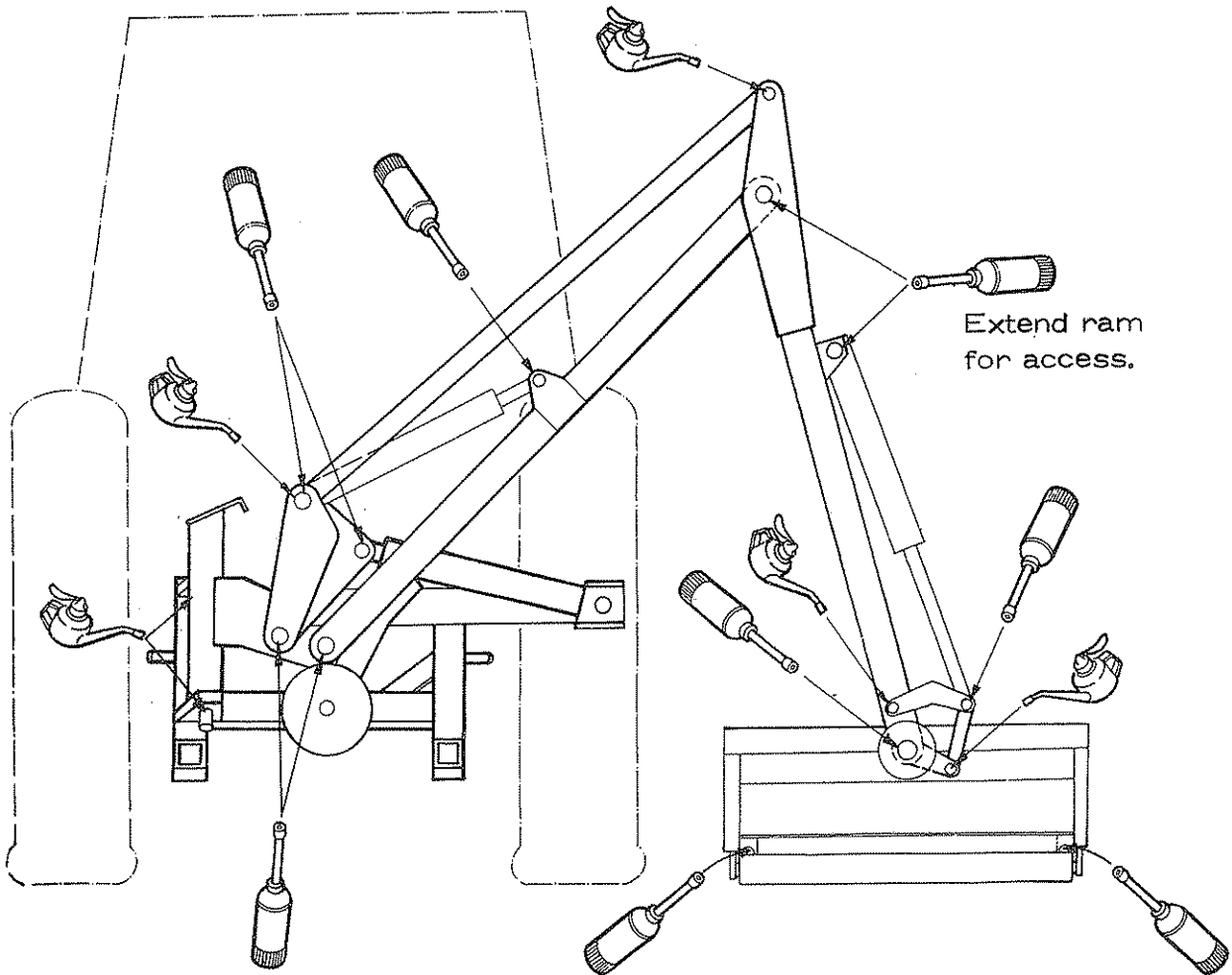
MAINTENANCE

The Power Arm 22 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.

2. 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.



(b) Gearbox

The gearbox is filled with 1 $\frac{3}{4}$ litres of Morris's Golden Film K21 gear grease on assembly and no additional topping up should be required in service. If at any time the gearbox is stripped for overhaul, the old grease should be washed out and replaced.

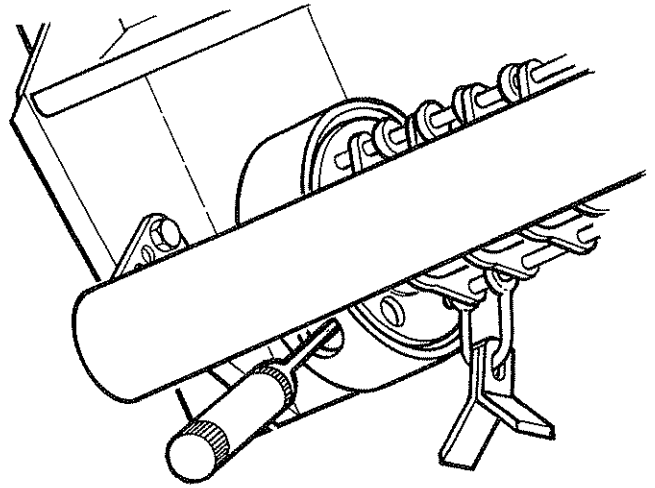
Access for filling is by removal of the small rectangular plate on the top of the gearbox. Removal of the complete flail head should be avoided whenever possible as it entails splitting the gearbox with the resultant loss of lubricant.

Important note:

A few earlier machines prior to serial No 00 BD 98 were filled with a mixture of Rocal and E.P. 90 gear oil. Replace with Morris's K21 gear grease after overhaul.

(c) Rotor bearings

Pay particular attention to the rotor shaft bearings. Access to the grease fitting at either end of the shaft is through a hole on the underside of the rotor bearing shroud ring.



The rotor shaft is carried by a pair of double sealed self-aligning ball bearings supported in a cast bearing block. Grease passes into an annulus machined in the block from where it is forced into the bearing through a hole in the periphery of the outer race.

For increased bearing life use Agricaströl 'Multi-use' grease or its equivalent rather than a general purpose grease.

Note: The bearing and carrier block is only replaced as an assembly.

(d) Power Take-off Shaft

The P.T.O. 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 approx. 100 hour intervals.

(e) 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.

(f) Pulley bearings

These are pre-packed and sealed and should require no further attention other than replacement during a major machine overhaul.

3. 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).

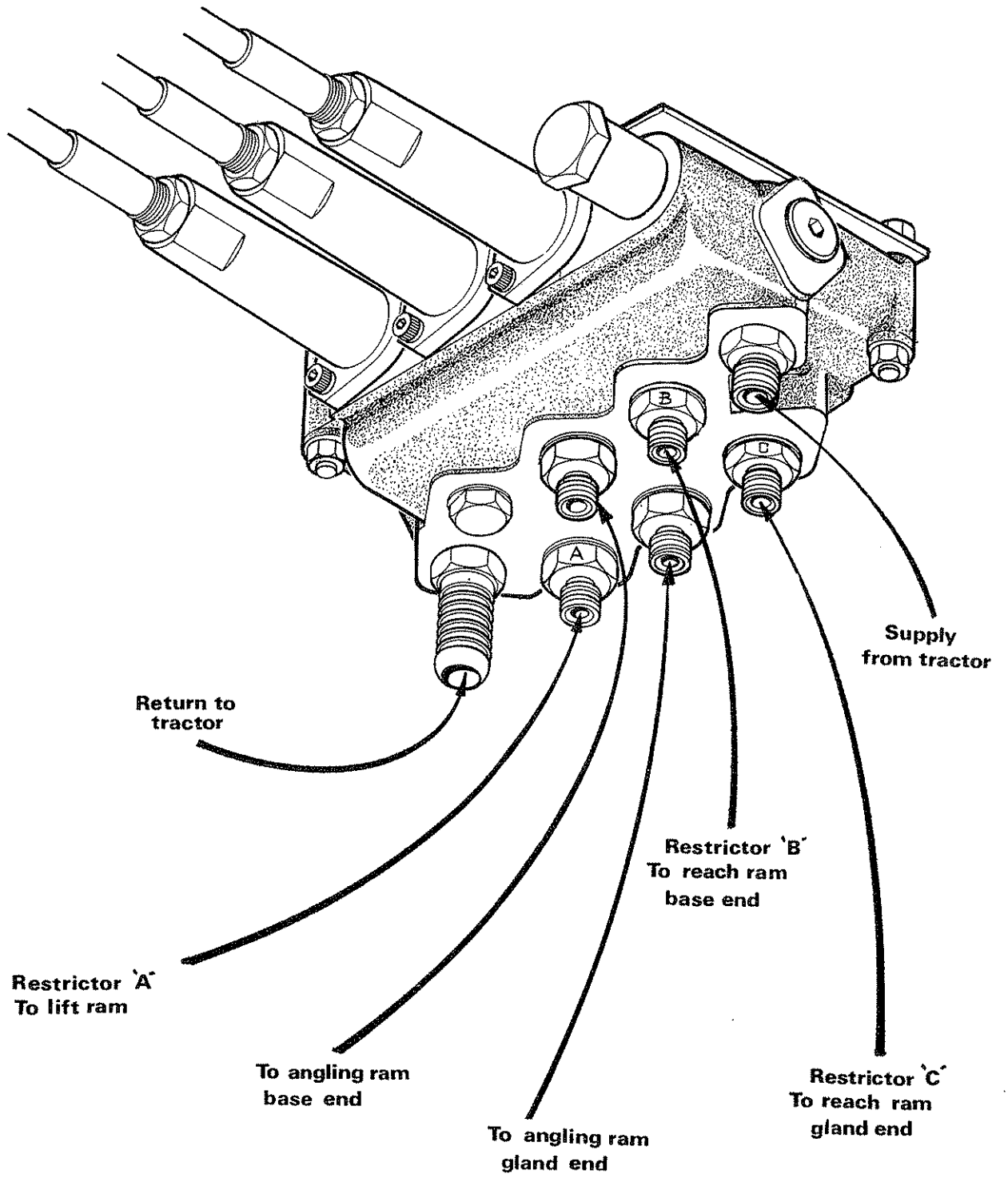
4 HOSES

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) Where 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 CONNECTIONS

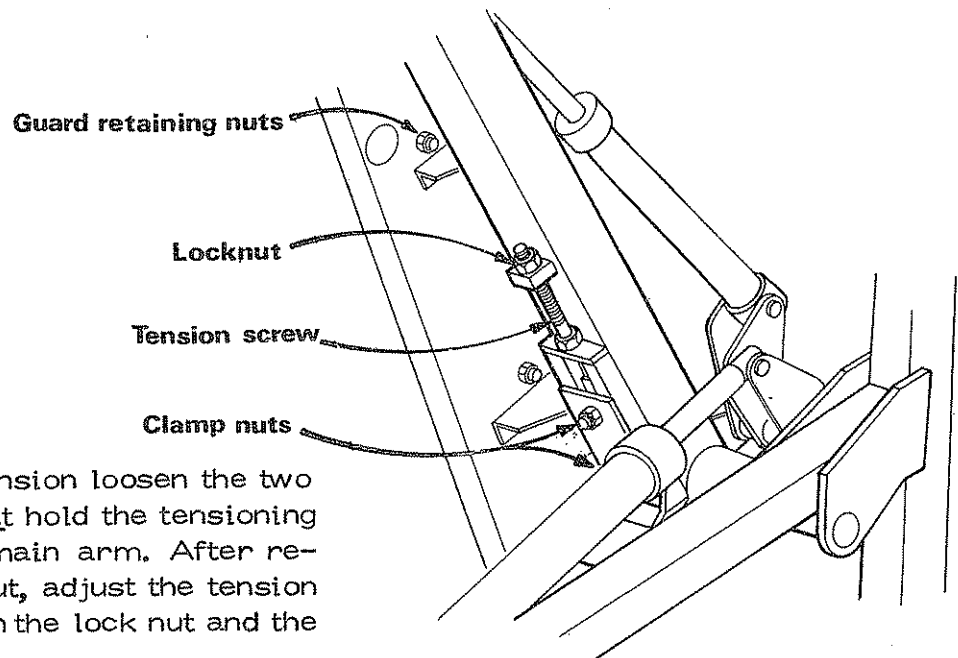
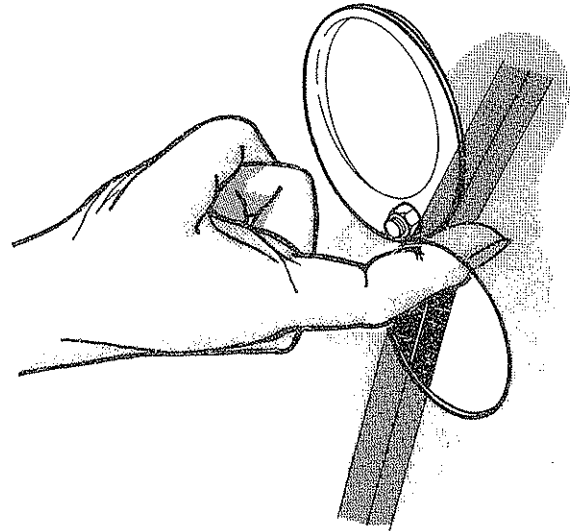


5. BELTS

a) Primary - Drive belts

Belt tension is approximately correct when with one finger a single belt can be deflected flush with the upper edge of the inspection hatch in the inner guard.

The disc that covers the inspection hatch is pushed to one side. Do not loosen the bolt that secures it. Return the disc to stop rubbish entering after completing adjustment.



To adjust the tension loosen the two clamping nuts that hold the tensioning bracket to the main arm. After releasing the lock nut, adjust the tension screw. Re-tighten the lock nut and the two clamp nuts.

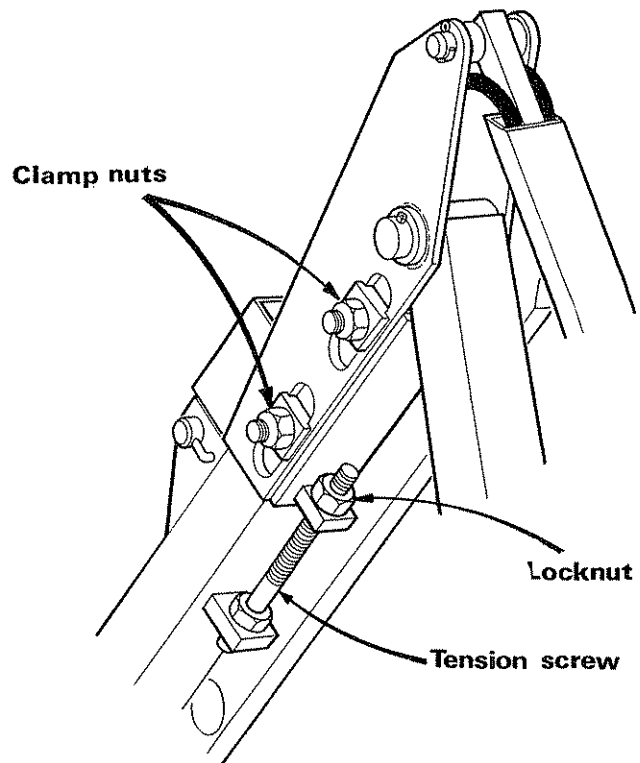
Belts should only be replaced in pairs. To change the belts, release all tension and remove the rear guard by undoing the three nuts on the inner guard.

After replacing belts, re-tension and check again after a short period of work as new belts are subject to initial stretch and 'bedding-in'.

b) Secondary-Drive belts

Belt tension is checked in the same way as the primary-drive.

To adjust the tension slacken the two clamp nuts on the upper section of the reach arm. Loosen locknut and adjust the tension screw. Re-tighten the lock nut and two clamp nuts. It will be necessary to replace the belts when the shouldered clamps have reached the limit of adjustment. Replacement of the belts is carried out in the same way as the primary-drive.

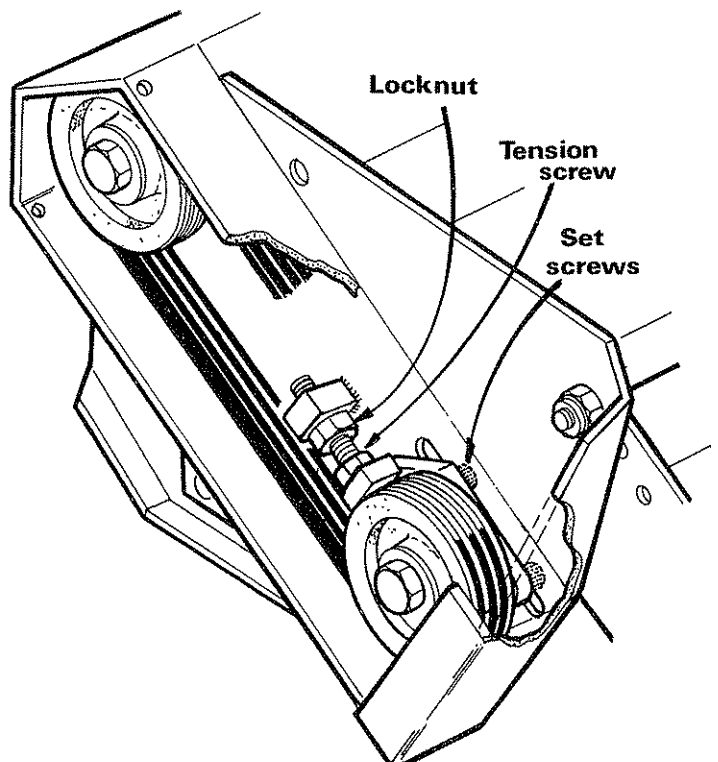


c) Rotor-Drive belts

To check the adjustment of the triple 'wedge' belts that drive the rotor, remove the two set screws that secure the belt cover. Tension is approximately correct when the belts can be deflected 1/2" (13 mm) midway between the two pulleys.

To adjust the tension, slacken off the four setscrews which clamp the bearing blocks to each side of the flail cover. These setscrews are reached by a socket spanner through holes in the end plate of the rotor shaft.

Release the locknuts and adjust the tension screws an equal amount on both ends of the rotor. The amount of movement of the tensioner plate in the slotted holes of the flail cover can be used as a guide. Re-tighten the locknuts and the eight setscrews. Replace the covers at both ends of the flail head. The belts should be replaced as a set when maximum adjustment in the slotted holes has been reached.

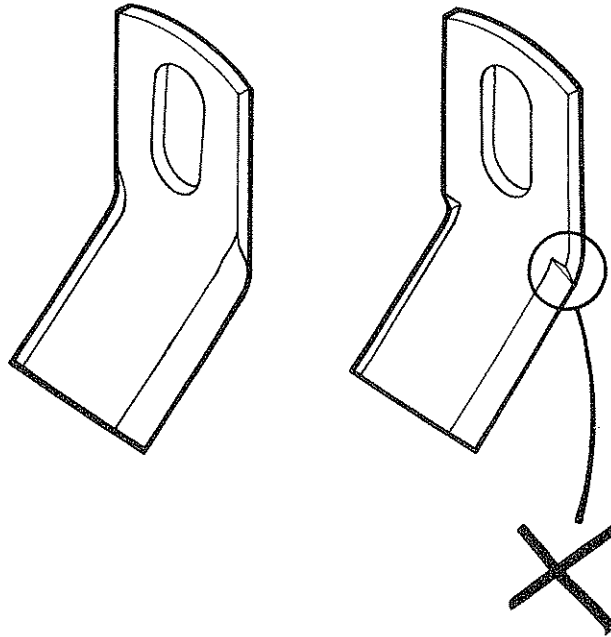


6. FLAIL HEAD

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

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 are double-edged and so can be turned round for increased life. Flails can also be removed and sharpened on a grindstone. It is better to remove all the flails and sharpen them as a set, taking the same amount off each in an effort to retain balance. Do not remove more material than is necessary. When sharpening, avoid making a corner at the upper limit of the cutting surface and do not grind to a thin knife edge. This would very rapidly be destroyed when the flail is put into use.



7. 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.

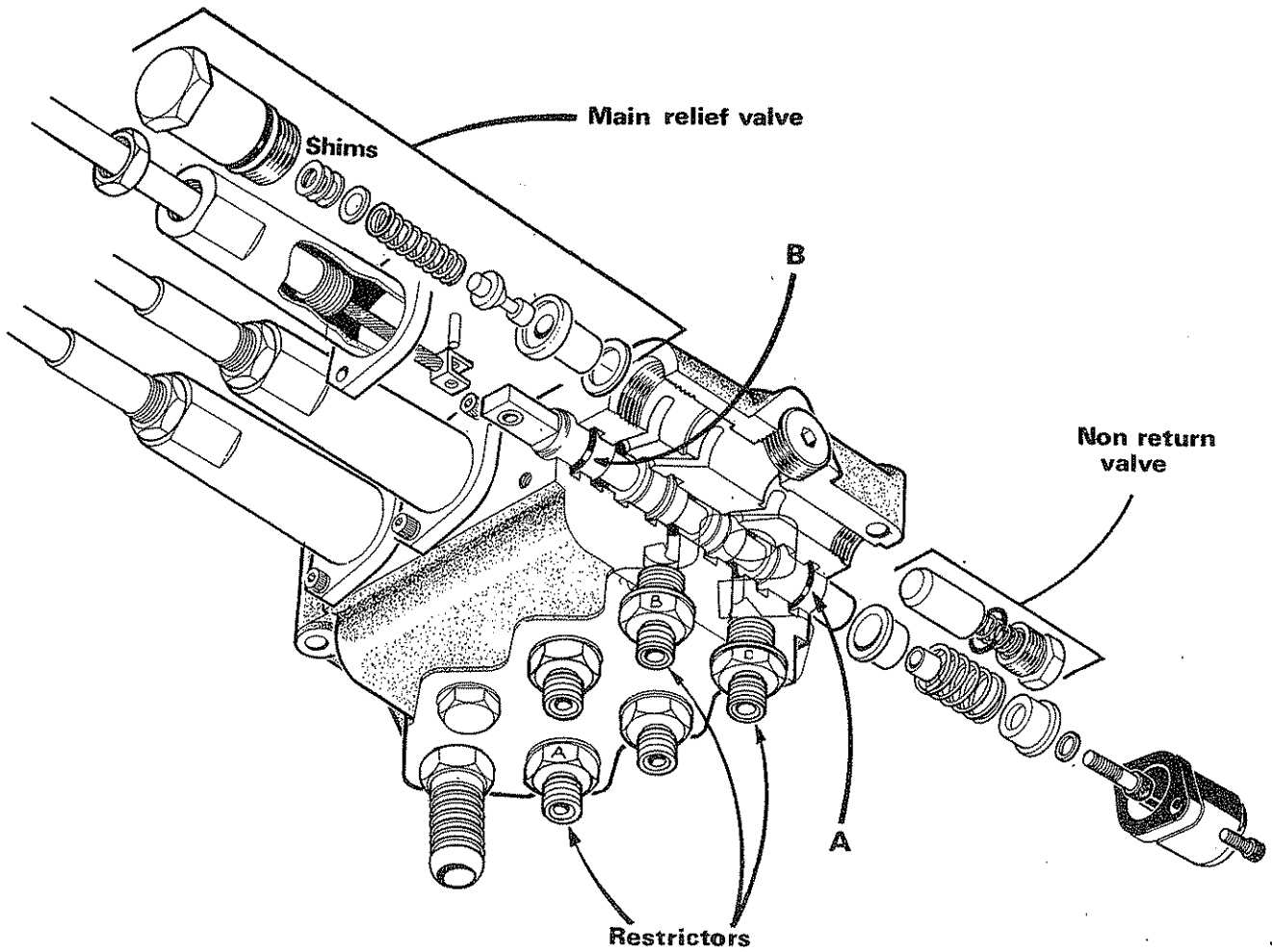
Caution: On no account should any attempt be made to lubricate the cables which are assembled with a special lubricant during manufacture.

8. 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 1800 psi (126 Bars)

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.

8. 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.

8. 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.

SPARE PARTS MANUAL



USE ONLY McCONNEL SPARE PARTS

To be assured of the latest design improvements purchase your genuine replacements from the original equipment manufacturer F.W. McConnel Ltd. through your local dealer or stockist.

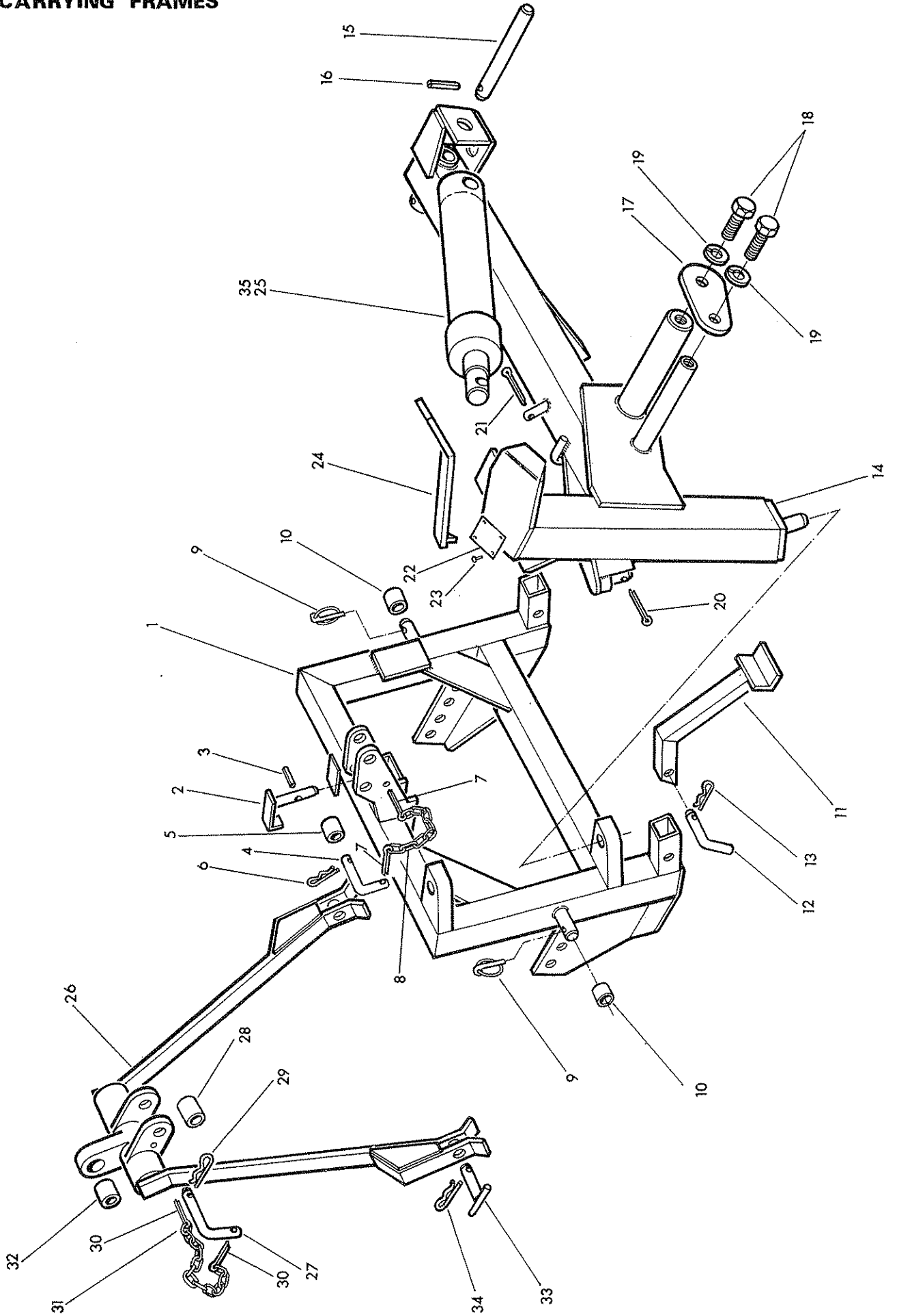
Always quote machine type and serial number as well as the part number.

Design improvement 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

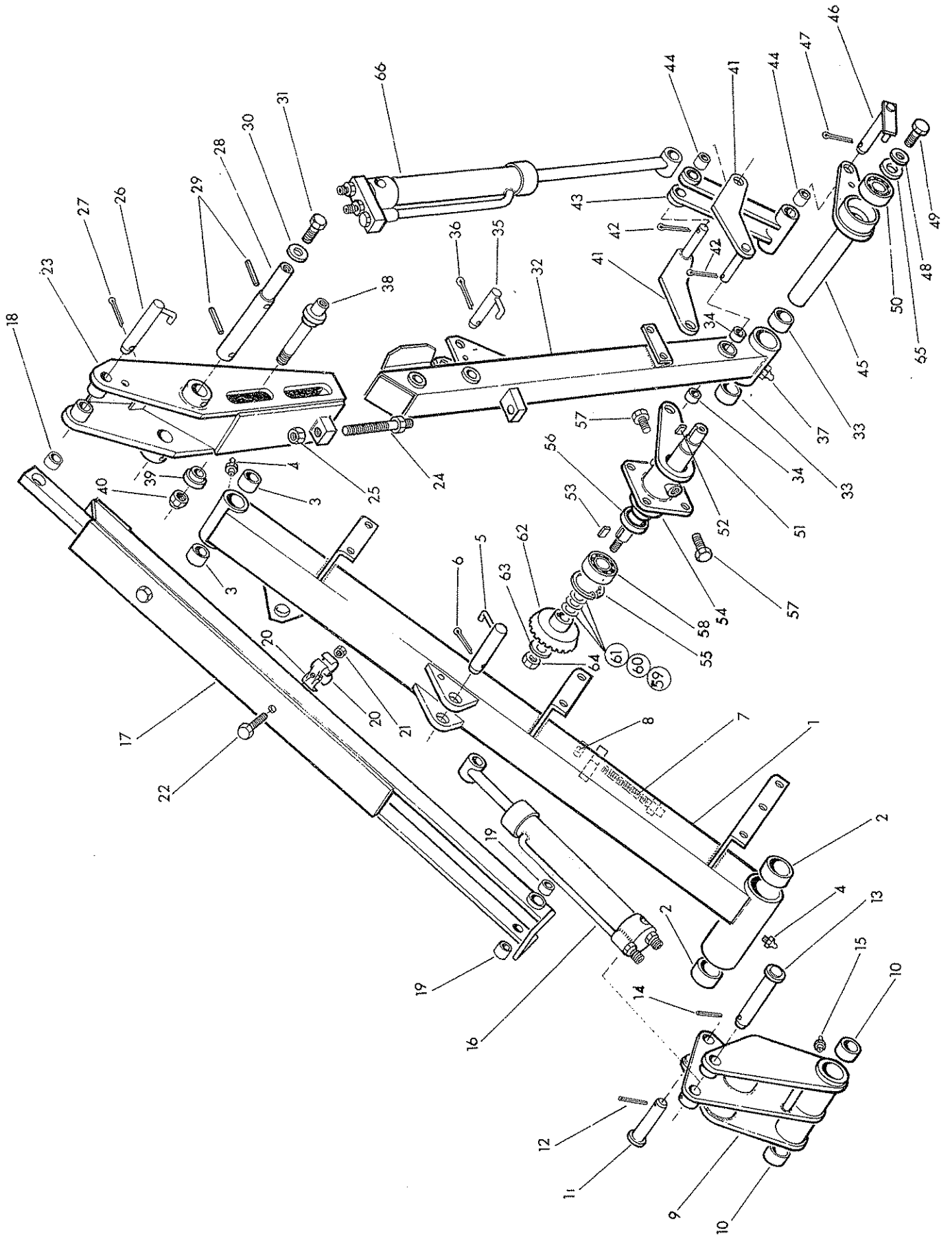
Many spares are supplied as Assemblies or as Sub-assemblies and, to help the customer determine the composition of an Assembly, the Dot System is used. The Main Assembly will not show a dot preceding its description and is printed in BLOCK CAPITALS. Subsequent listed parts are preceded by one or more 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



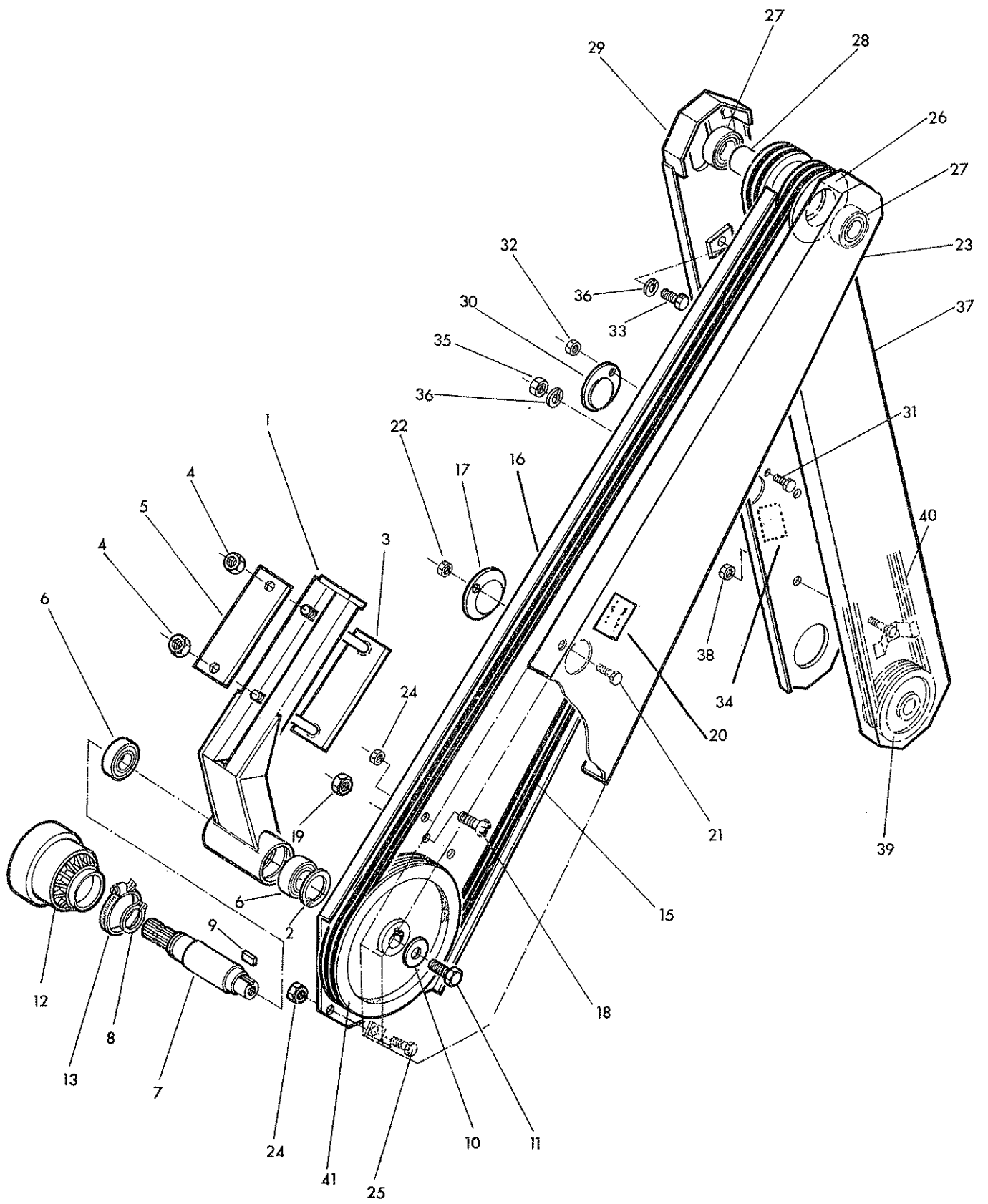
Ref	Part No.	Qty	Description
	71 11 250		PA22 FLAIL HEDGE TRIMMER
1	71 11 257	1	.Initial frame c/w pins etc.
2	71 11 132	1	..Breakaway lock pin c/w spring dowel
3	04 25 630	1	...Spring dowel $\varnothing 6 \times 30$
4	14 67 049	1	..Top link pin c/w chain, sleeve etc.
5	14 67 063	1	...Sleeve
6	04 31 105	1	...Spring cotter
7	95 01 255	2	...Split pin $\varnothing 4 \times 25$
8	14 67 086	1	...Light chain 6" long
9	04 31 217	2	..Linch pin
10	14 67 096	2	..Sleeve (Cat II)
11	71 11 258	2	.Stand leg c/w pin
12	71 09 060	1	..Leg pin c/w spring cotter
13	04 31 105	1	...Spring cotter
14	71 11 263	1	.Tee frame c/w pins etc.
15	71 11 113	1	..Lift ram base pin c/w spring dowel
16	04 28 140	1	...Spring dowel $\varnothing 10 \times 40$
17	71 11 114	1	..Retaining plate
18	93 13 088	2	..Set screw M20 x 40
19	91 00 208	2	..Spring washer $\varnothing 20$
20	95 01 507	1	..Split pin $\varnothing 6 \times 50$
21	95 01 406	1	..Split pin $\varnothing 5 \times 40$
22	71 11 115	1	..Serial plate
23	71 03 230	4	..Pop rivet 1/8" diameter
24	71 11 116	1	.Breakaway strap
25	71 11 282	1	.Lift ram assembly (see page44)
26	71 11 259	1	.Stabilizer c/w pins etc.
27	14 67 049	1	..Top link pin c/w chain, sleeve, etc.
28	14 67 063	1	...Sleeve
29	04 31 105	1	...Spring cotter
30	95 01 255	2	...Split pin $\varnothing 4 \times 25$
31	14 67 086	1	...Light chain 6" long
32	71 11 006	1	..Sleeve (Cat I)
33	71 11 007	2	..Stabilizer pin c/w spring cotter
34	04 31 105	1	...Spring cotter

ARMHEAD



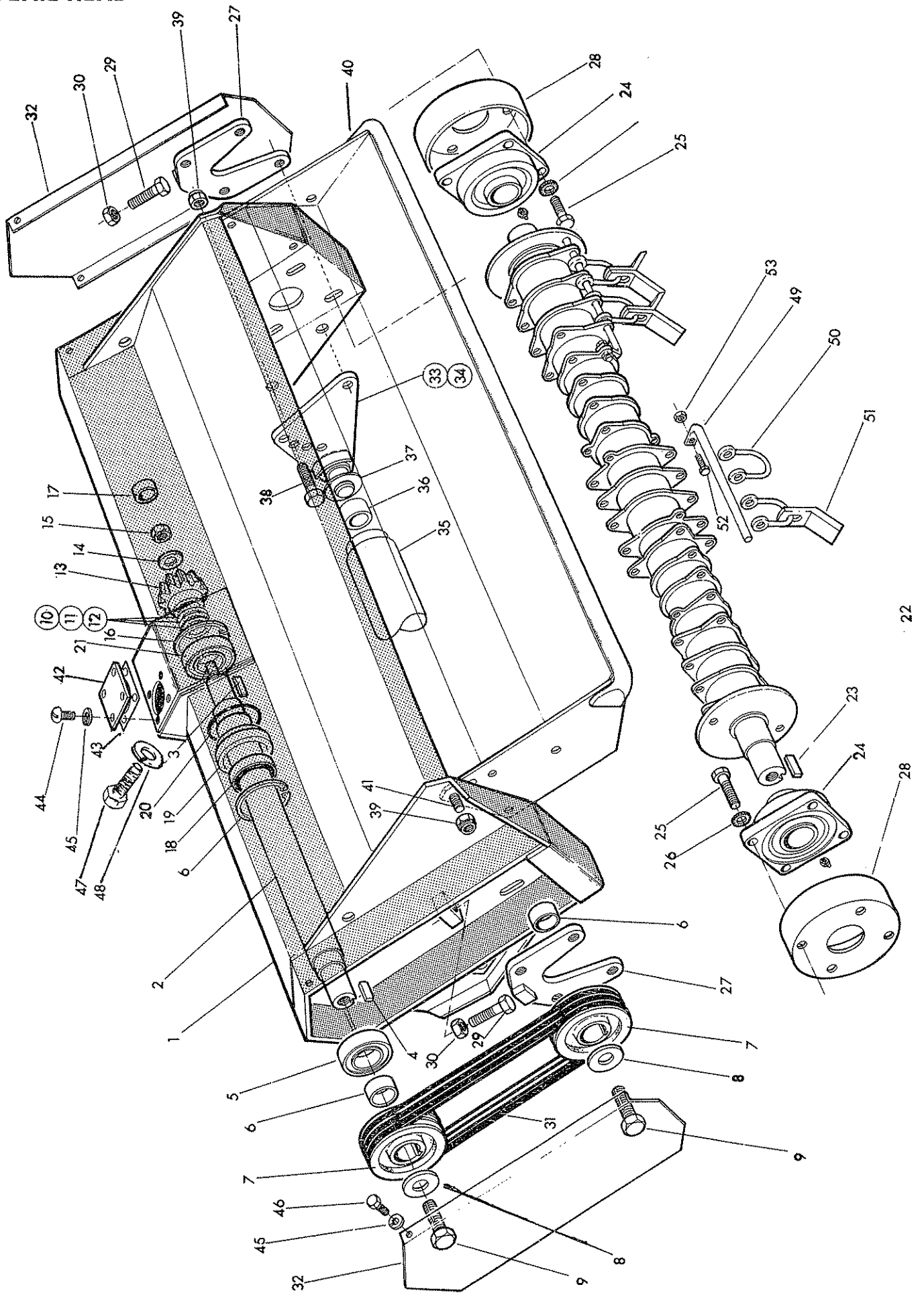
Ref	Part No.	Qty	Description
	71 11 250		P.A.22 FLAIL HEDGE TRIMMER (continued)
1	71 11 280	1	..Main arm c/w bushes, nuts etc.
2	60 00 161	2	..Bush
3	72 16 001	2	..Bush
4	09 01 121	2	..Greaser straight 1/8 BSP
5	71 09 062	1	..Reach ram rod end pin c/w split pin
6	05 03 126	1	...Split pin 1/4 diameter x 1.1/2 long
7	71 11 039	1	..Belt adjuster screw
8	91 13 007	1	..Hexagon nut M16
9	71 11 265	1	..Rocker c/w bushes etc.
10	60 00 160	2	..Bush
11	71 11 069	1	..Lift ram rod end pin c/w spring dowel
12	04 28 140	1	...Spring dowel \varnothing 10 x 40
13	71 11 068	1	..Reach ram base end pin c/w spring dowel
14	04 28 140	1	...Spring dowel \varnothing 10 x 40
15	09 01 121	1	..Greaser straight 1/8 BSP
16	71 11 283	1	..Reach ram assembly (see page 45)
17	71 11 281	1	..Parallel motion link c/w bushes etc.
18	71 01 083	1	..Bush
19	72 14 060	2	..Bush
20	60 12 026	4	..Hose clip
21	91 43 005	2	..Self-locking nut M10
22	92 13 085	2	..Bolt M10 x 40
23	71 11 284	1	..Carrier assembly c/w pins etc.
24	71 11 039	1	..Belt adjuster screw
25	91 13 007	1	..Hexagon nut M16
26	71 11 047	1	..Link pin c/w split pin
27	95 01 406	1	...Split pin \varnothing 5 x 40
28	71 11 048	1	..Pivot pin c/w screw and washer etc.
29	04 46 260	2	..Spring dowel
30	71 11 016	1	..Pulley retaining washer
31	71 11 034	1	..Pulley retaining screw
	71 11 256	1	..Dipper arm assembly
32	71 11 286	1	..Dipper arm c/w pins, bushes etc.
33	10 80 041	2	...Bush
34	71 01 083	2	...Bush
35	71 09 071	1	...Angling ram base pin c/w split pin
36	05 03 126	1	...Split pin 1/4" dia. x 1.1/2" long
37	09 01 121	1	...Greaser straight 1/8" BSP
38	71 11 066	2	..Tee bolt c/w nuts
39	71 11 067	1	...Tee nut
40	01 41 007	1	...Self-locking nut 3/4" UNF
41	71 11 053	2	..Radius arm c/w split pin
42	95 01 406	1	...Split pin \varnothing 5 x 40
43	71 11 054	1	..Save link c/w bushes
44	71 01 083	4	...Bush
45	71 11 279	1	..Head pivot tube
46	71 11 055	1	..Slave link pin c/w split pin
47	95 01 406	1	...Split pin \varnothing 5 x 40
48	71 11 016	1	..Pulley washer
49	71 11 034	1	..Pulley retaining screw
50	06 00 042	2	..Bearing
51	71 11 277	1	..Head hinge drive shaft c/w keys
52	71 11 036	1	...Key 10 x 8 x 25 long
53	71 11 035	1	...Key 8 x 7 x 32 long
54	71 11 278	1	..Head hinge mounting tube c/w circlips etc.
55	04 16 280	1	...Internal circlip \varnothing 80
56	86 29 136	1	...Seal
57	71 11 070	2	...Locating screw
58	06 03 840	1	..Bearing
59	71 11 029	as reqd	..Shim .1 mm thick
60	71 11 028	as reqd	..Shim .25 mm thick
61	71 11 027	as reqd	..Shim 1 mm thick
62	71 11 273	1	..Gear
63	71 11 014	1	..Gear retaining washer
64	91 00 001	1	..Self-locking nut M16
65	71 11 092	1	..Pulley spacer
66	71 11 283	1	..Angling ram assembly (see page 46)

GUARDS & DRIVE



Ref	Part No.	Qty	Description
	71 11 250		PA22 FLAIL HEDGE TRIMMER (continued)
	71 11 255	1	.Primary drive assembly
1	71 11 287	1	..Pulley carrier c/w circlip
2	04 16 280	1	...Circlip Ø80 internal
3	71 11 059	1	..Carrier clamp c/w nuts
4	01 41 007	2	...Self-locking nuts ¼" UNF
5	71 11 060	1	..Clamp plate
6	06 00 042	2	..Bearing
7	71 11 288	1	..Primary shaft c/w key and circlip
8	04 21 240	1	...Circlip Ø40 external
9	71 11 061	1	...Key 10 x 8 x 40 long
10	71 11 016	1	..Pulley retaining washer
11	71 11 034	1	..Self-locking set screw M16 x 30
12	71 11 038	1	..Protection cone
13	09 04 114	1	..Hose clip
14	71 11 270	1	. P.T.O. pulley
15	71 11 031	1	.Primary drive belts (set of 2)
16	71 11 290	1	.Main arm fixed guard c/w screws etc.
17	71 11 136	1	..Inspection cover
18	93 13 055	7	..Setscrew M10 x 25
19	91 43 045	7	..Aeronut M10
20	71 11 145	1	..Belt tension label
21	93 13 023	1	..Setscrew M6 x 12
22	91 43 003	1	..Self-locking nut M6
23	71 11 291	1	.Main arm outer guard c/w nuts
24	91 43 005	4	..Self-locking nut M10
25	71 11 141	1	..Angle screw
26	71 11 271	1	.Intermediate pulley
27	06 00 042	2	.Bearing
28	71 11 049	1	.Bearing spacer
29	71 11 295	1	.Dipper arm fixed guard c/w screws
30	71 11 136	1	..Inspection cover
31	93 13 023	1	..Setscrew M6 x 12
32	91 43 003	1	..Self-locking nut M6
33	93 13 055	4	..Setscrew M10 x 25
34	71 11 145	1	..Belt tension label
35	91 43 005	2	..Self-locking nut M10
36	91 00 205	2	..Spring washer M10
37	71 11 297	1	.Dipper arm outer guard c/w nuts
38	91 43 005	3	..Self-locking nuts M10
39	71 11 021	1	.Final drive pulley
40	71 11 032	1	.Intermediate belts (set of 2)
41	71 11 270	1	.Power take-off pulley
	71 11 268	1	.PTO drive shaft assembly (not illustrated)

FLAIL HEAD

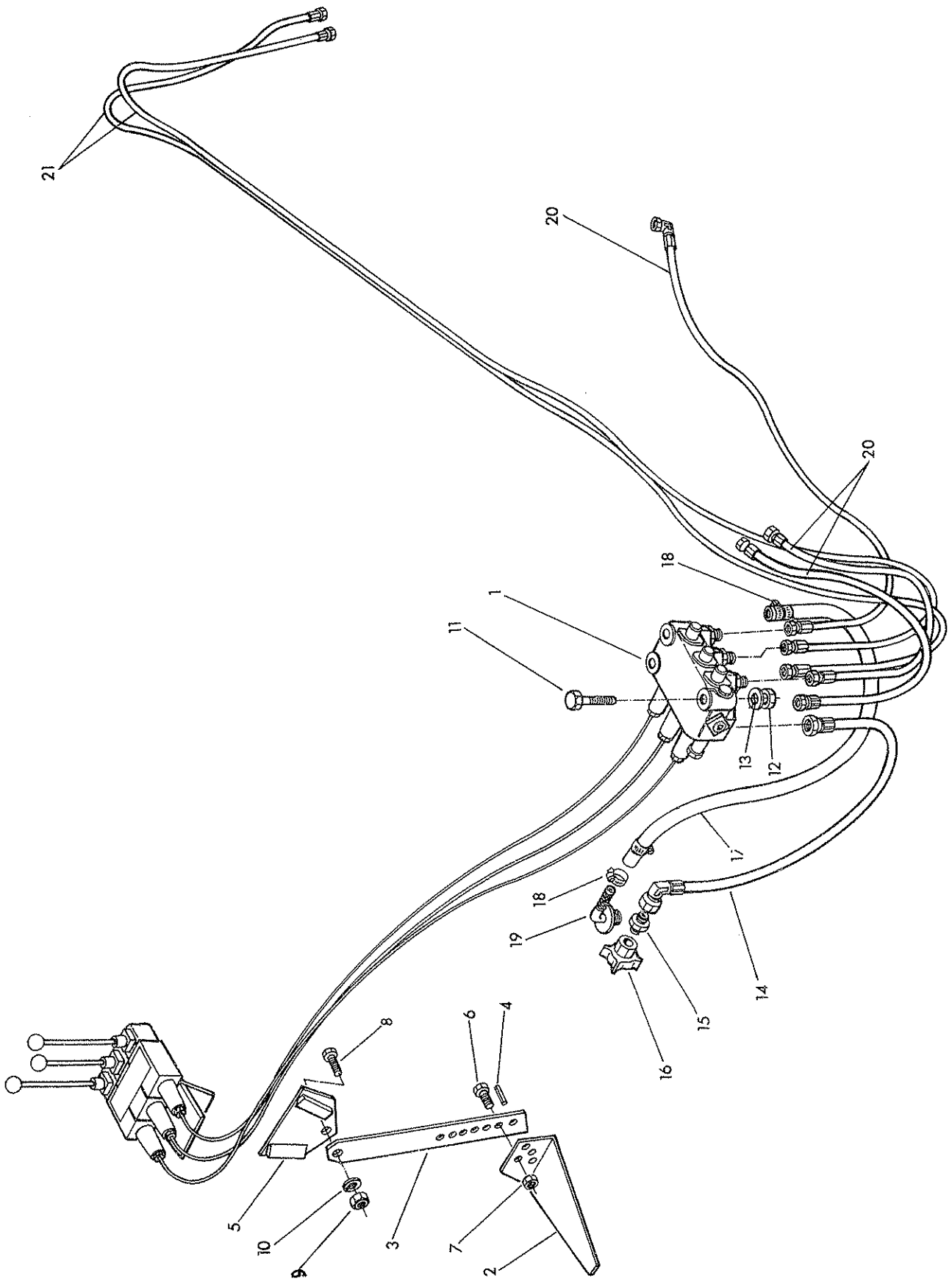


Ref	Part No.	Qty	Description
	71 11 300		PA22 FLAIL HEAD
1	71 11 303	1	.Flail casing
2	71 11 276	1	.Drive shaft c/w keys
3	71 11 035	1	..Key 8 x 7 x 30 long
4	71 11 036	1	..Key 10 x 8 x 25 long
5	06 00 042	1	.Bearing
6	71 11 015	2	.Pulley spacer
7	71 11 020	2	.Pulley
8	71 11 016	2	.Pulley retaining washer
9	71 11 034	2	.Pulley retaining screw
10	71 11 023	as reqd	.Shim 1 m/m thick
11	71 11 024	as reqd	.Shim .25 m/m thick
12	71 11 025	as reqd	.Shim .1 m/m thick
13	71 11 272	1	.Pinion gear
14	71 11 017	1	.Pinion retaining washer
15	91 00 001	1	.Self-locking nut M16
16	04 16 280	2	.Internal circlip Ø80
17	71 11 040	1	.Gearbox coreplug
18	86 29 136	1	.Seal
19	71 11 160	1	.Seal carrier
20	87 00 740	1	.'0' ring
21	06 03 840	1	.Bearing
22	71 11 269	1	.Rotor c/w key
23	71 11 036	1	..Key 10 x 8 x 25 long
24	06 00 041	2	.Flange bearing unit
25	93 13 076	8	.Set screw M12 x 35
26	91 00 406	8	.External serrated washer Ø12
27	71 11 267	2	.Belt tension plate
28	71 11 266	2	.Shroud ring
29	93 13 146	2	.Belt tensioner set screw M12 x 70
30	91 13 006	2	.Hexagon nut M12
31	71 11 033	1	.Wedge belts(set of 3)
32	71 11 310	2	.Belt cover
33	71 11 090	1	.Roller bracket right hand (not illustrated)
34	71 11 091	1	.Roller bracket left hand
35	71 11 087	1	.Roller c/w bushes
36	72 13 023	2	..Bush
37	60 01 136	2	.Thrust washer
38	93 13 076	4	.Set screw M12 x 35
39	91 43 006	8	.Self-locking nut M12
40	71 11 311	1	.Hood
41	93 13 046	4	.Set screw M12 x 20
42	71 11 074	1	.Gearbox inspection cover
43	71 11 018	1	.Inspection cover gasket
44	93 73 024	4	.Round headscrew M8 x 10
45	91 00 204	8	.Spring washer Ø8
46	93 13 034	4	.Set screw M8 x 16
47	93 13 067	4	.Set screw M16 x 30
48	91 00 207	4	.Spring washer Ø16
49	71 11 019	10	.Flail pivot pin
50	73 14 183	20	.Flail shackle
51	71 11 022	40	.Flail
52	03 11 103	10	.Set screw 3/8" UNF x 1¼" long
53	01 41 003	10	.Self-locking nut 3/8 UNF

Special Note

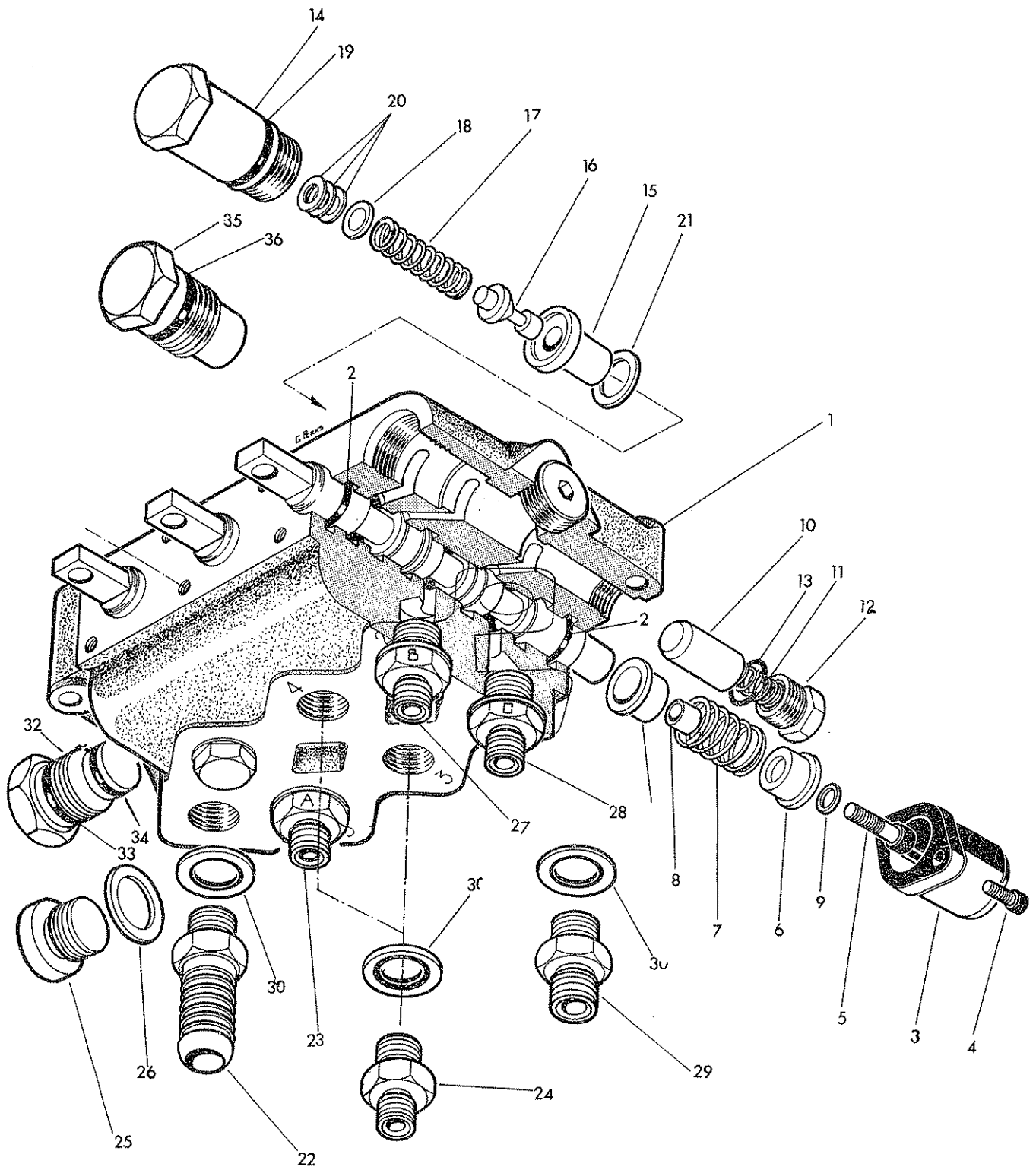
If sealed bearings are supplied as spares for the gearbox it is essential to remove both the sealing rings from the bearing. Earlier machines that is up to serial no. 02BD23 that did not have a sealed gearbox should be supplied with sealed bearings.

HYDRAULIC INSTALLATION



Ref	Part No.	Qty	Description
	80 17 300		PA22 HYDRAULIC INSTALLATION
1	81 30 255	1	.Control assembly (see pages 40 and 42)
	71 09 319	1	.Universal socket and pillar comprising :-
2	71 09 320	1	..Sandwich plate
3	71 09 146	1	..Pillar c/w spring dowel
4	04 22 816	1	...Spring dowel
5	71 09 147	1	..Socket
6	93 13 066	1	..Set screw M12 x 30
7	91 13 006	1	..Hexagon nut M12
8	03 11 086	1	..Set screw 5/8 UNF x 1" long
9	01 11 006	1	..Hexagon nut 5/8 UNF
10	01 00 206	1	..Spring washer 5/8 UNF
11	92 13 124	3	.Bolt M8 x 60
12	91 13 004	3	.Hexagon nut M8
13	91 00 204	3	.Spring washer \varnothing 8
14	85 31 223	1	.Hose (supply from tractor) 3/8 BSP S-F 90 ^o -F 59" lg
15	60 00 113	1	.Adaptor 3/8 BSP M-M
16	85 90 023	1	.Self-seal coupling - Female half
17	85 01 053	1	.Hose (return to tractor) 5/8 bore 60" long
18	09 04 204	4	.Hose clip
19	To suit	1	.Return connection
20	85 36 032	3	.Hose (Reach & Lift to valve) 1/4" BSP S-F 90 ^o -F 64" lg
21	85 16 042	2	.Hose (Angling to valve) 1/4" BSP S-F S-F 153" long

CONTROL VALVE



Ref	Part No.	Qty	Description
	81 30 255		HYDRAULIC CONTROL ASSEMBLY
	81 30 254	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	1	..Restrictor union 'A' ¼ BSP - 3/8 BSP
24	85 81 145	2	..Union 3/8" BSP - ¼" BSP M - M
25	81 30 061	1	..Cap
26	81 30 064	1	...Copper sealing washer
27	81 30 047	1	..Restrictor union 'B' ¼" BSP - 3/8" BSP
28	81 30 048	1	..Restrictor union 'C' ¼ BSP - 3/8 " BSP
29	60 00 113	1	..Union 3/8" BSP M - M
30	86 50 103	8	..Bonded seal 3/8" BSP

86 99 163

SEAL KIT

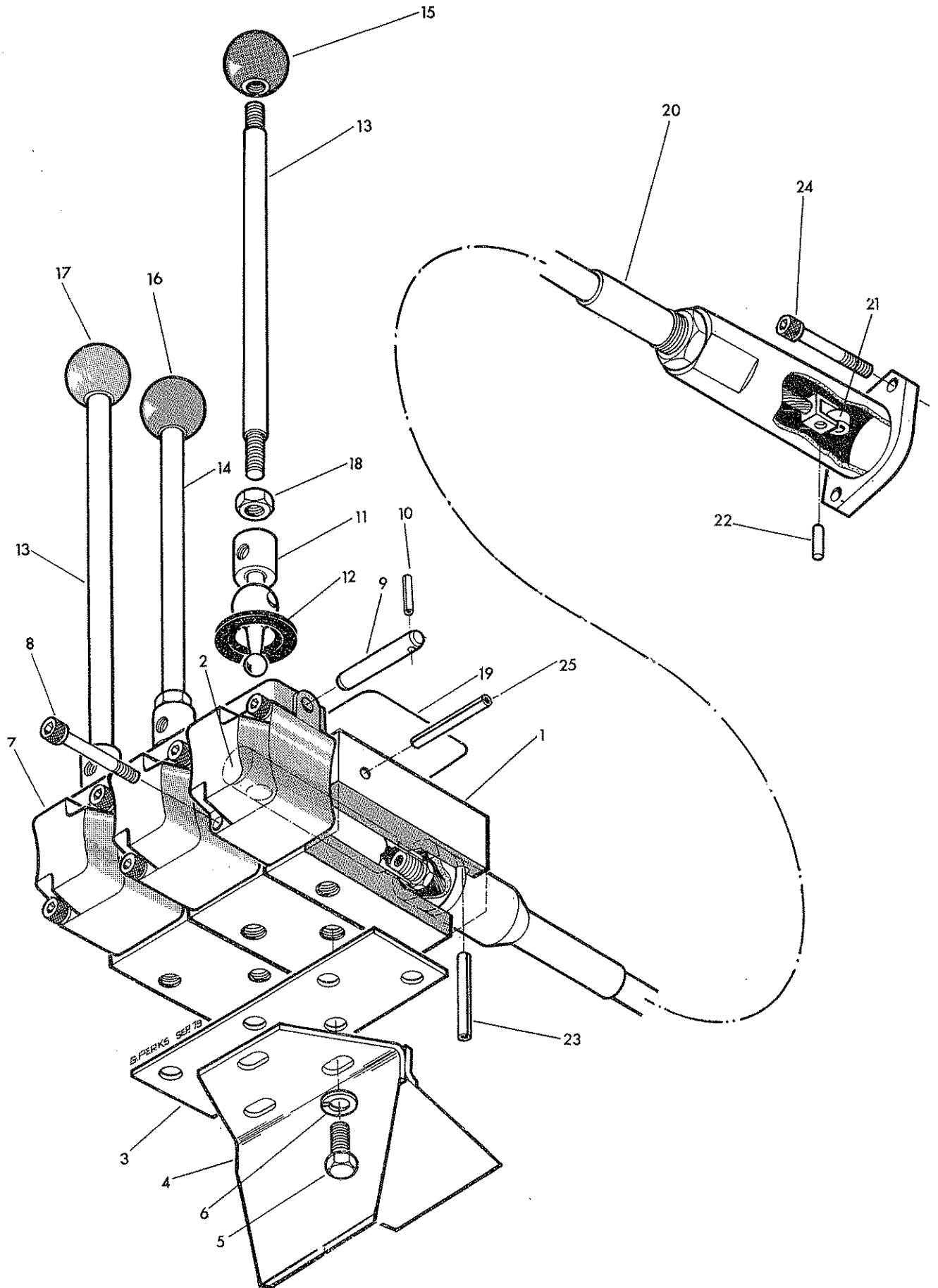
From machine serial No. 01 BD 22 a kit is available to convert the control valve to closed-centre operation, and comprises of the following :-

Ref	Part No.	Qty	Description
	81 30 059		CLOSED CENTRE CONVERSION KIT
32	81 30 055	1	..Plug c/w 'O' rings
33	86 00 505	1	.. 'O' ring
34	86 00 501	1	.. 'O' ring
35	81 30 056	1	..Relief valve blank plug c/w 'O' ring
36	86 00 113	1	.. 'O' ring

Special note when converting:

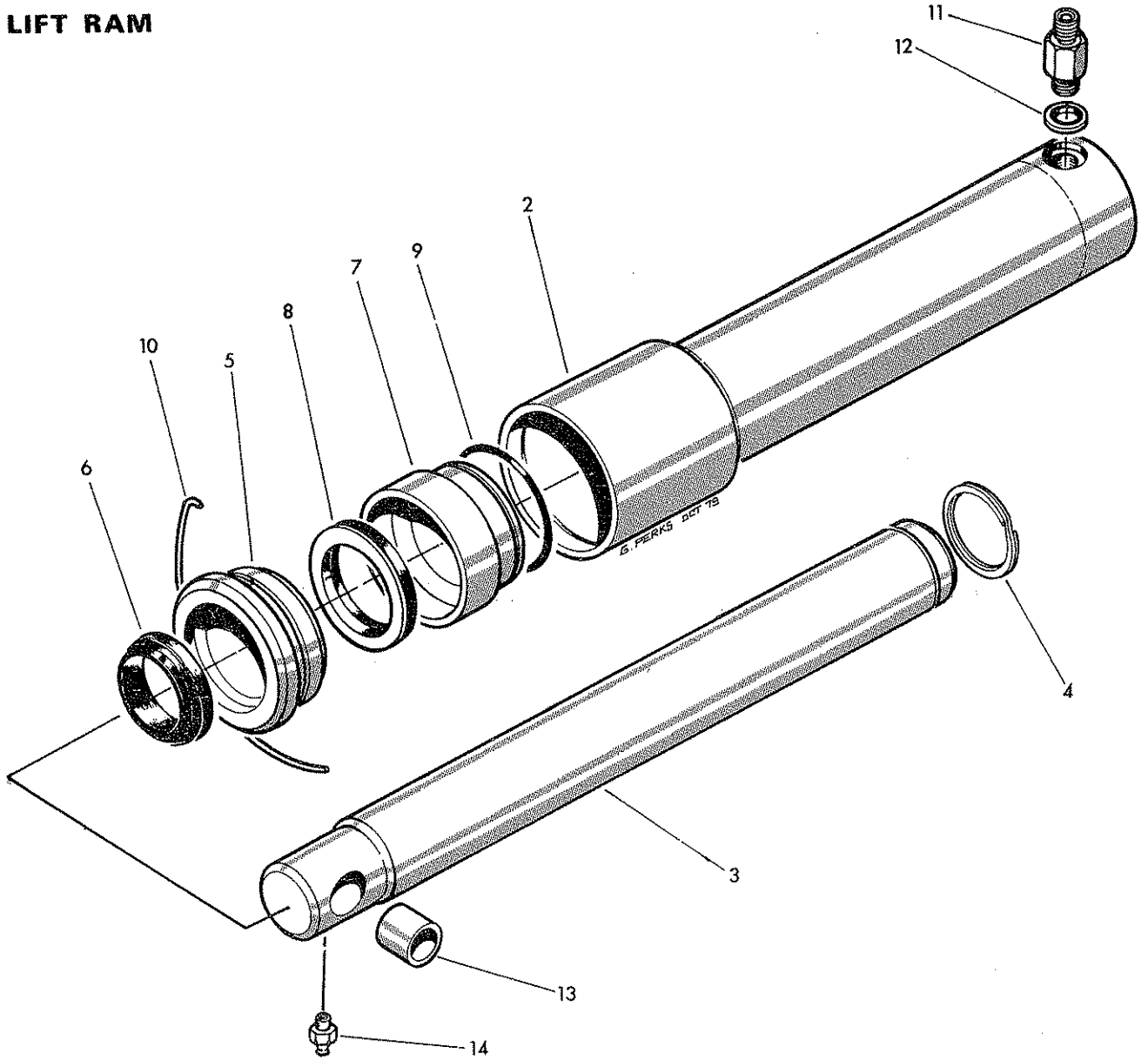
The copper sealing washer under the cap must be removed when installing the gallery blanking plug. The copper washer behind the relief valve housing must remain in position.

LEVERS & CABLES



Ref	Part No.	Qty	Description
	81 30 255		HYDRAULIC CONTROL ASSEMBLY (continued)
1	81 30 052	3	.Control block
2	81 30 053	3	.Control block spindle
3	80 17 002	1	.Control block mounting base
4	80 17 301	1	.Wedge plate
5	93 13 034	6	.Set screw M8 x 16
6	01 00 102	6	.Thin washer 5/16" diam.
7	81 30 001	3	.Lever pivot block
8	93 43 072	6	.Socket headed cap screw M5 x 35
9	81 30 009	3	.Lever spindle
10	81 30 021	3	.Spring dowel
11	81 30 019	3	.Lever
12	81 30 013	3	.Lever seal ring
13	71 09 131	2	.Lever handle long
14	71 09 132	1	.Lever handle short
15	09 03 112	1	.Lever knob - Red
16	09 03 113	1	.Lever knob - Green
17	09 03 114	1	.Lever knob - 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
21	80 17 004	1	..Spacer
22	80 17 005	1	..Pin
23	04 25 522	3	.Spring dowel $\varnothing 5 \times 22$
24	93 43 032	6	.Socket headed cap screw M5 x 16
25	04 25 540	3	.Roll pin $\varnothing 5 \times 40$

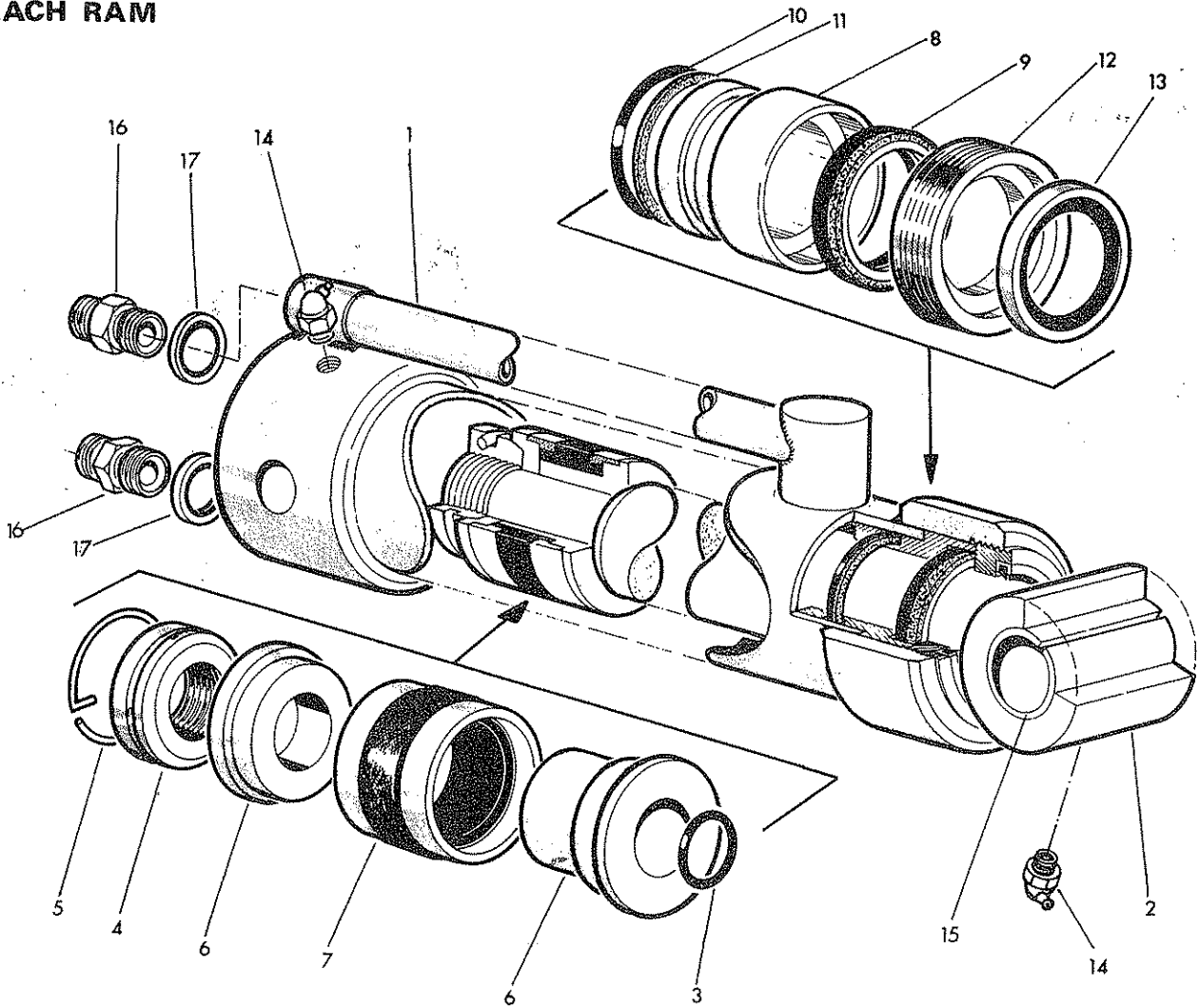
LIFT RAM



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

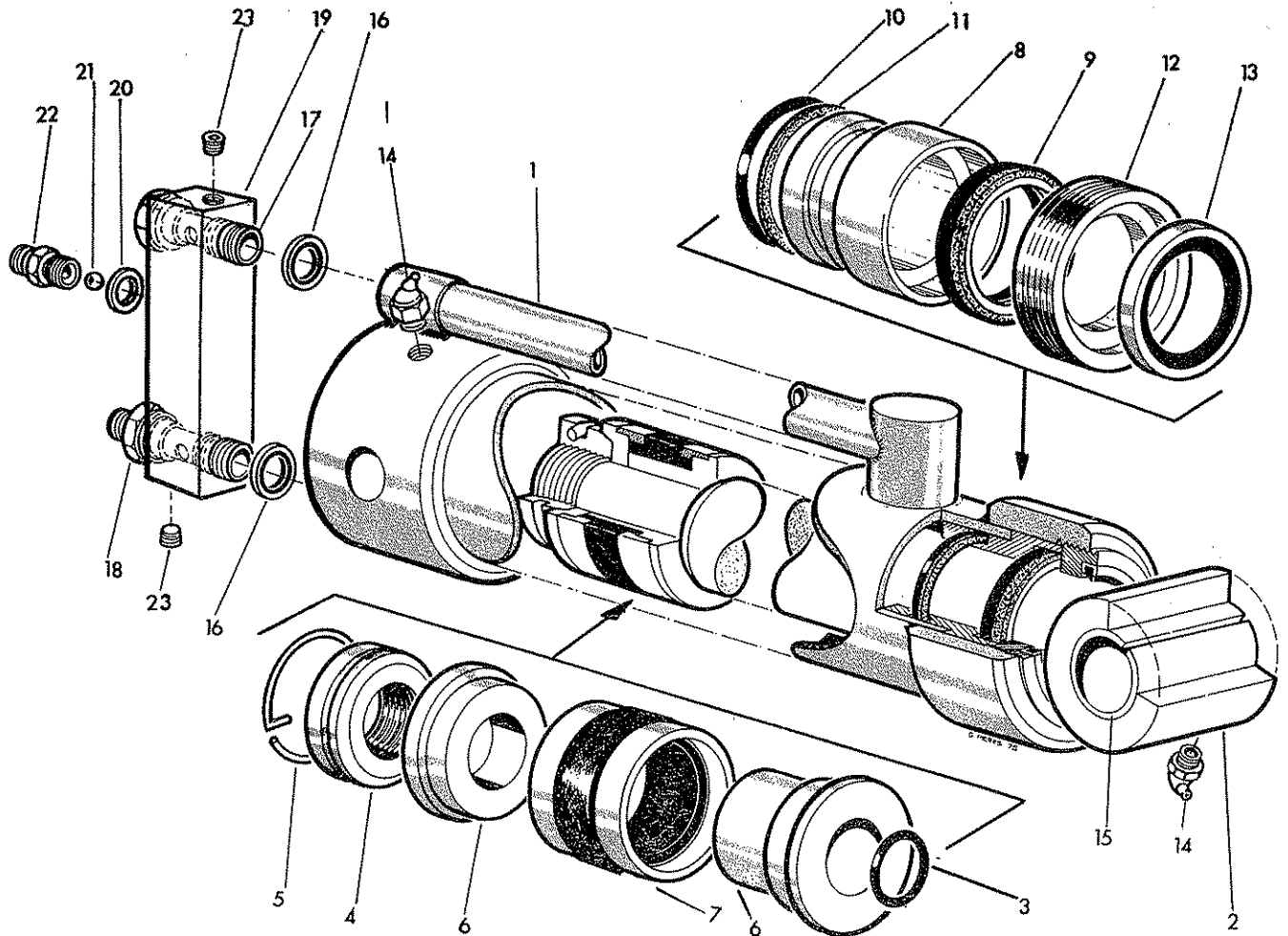
Seal Kit 86 99 154 comprising ref. nos. 6, 8, and 9.

REACH RAM



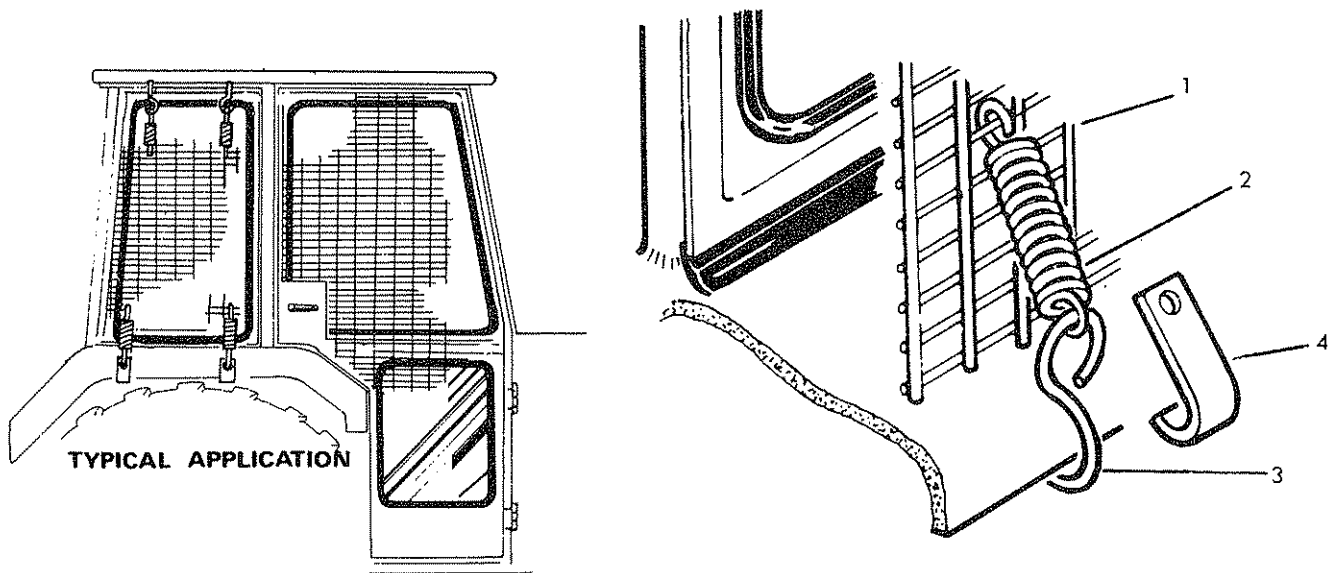
Ref	Part No.	Qty	Description
	71 11 283		REACH RAM ASSEMBLY
	71 03 316		.Ram basic comprising :-
1	71 03 304	1	..Ram cylinder
2	71 01 095	1	..Ram rod c/w bush 'O' ring and nut
3	86 00 119	1	... 'O' ring for piston rod
4	71 01 096	1	..Piston nut c/w locking ring
5	71 01 152	1	... Locking ring
6	71 01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

ANGLING RAM



Ref	Part No.	Qty	Description
	71 11 317		ANGLING RAM ASSEMBLY
	71 03 316		.Ram basic comprising :-
1	71 03 304	1	..Ram cylinder
2	71 01 095	1	..Ram rod c/w bush '0' ring and nut
3	86 00 119	1	... '0' ring for piston rod
4	71 01 096	1	..Piston nut c/w locking ring
5	71 01 152	1	...Locking ring
6	71 01 097	1	..Piston assembly c/w seal
7	86 35 131	1	...Piston seal
8	71 01 099	1	..Gland housing c/w seal and '0' ring
9	86 22 127	1	...Gland seal
10	86 00 304	1	... '0' ring
11	86 09 304	1	...Anti-extrusion ring
12	71 01 100	1	..Gland nut c/w wiper
13	86 40 328	1	...Piston rod wiper
14	09 01 124	2	.Greaser
15	71 05 050	1	.Bush rod end
16	86 50 103	4	.Bonded seal
17	81 30 054	1	.Banjo bolt 3/8" BSP
18	81 30 049	1	.Banjo union 1/4" BSP - 3/8" BSP
19	71 11 318	1	.Shuttle block c/w ball, union and seal, etc.
20	86 50 102	1	..Bonded seal 1/4" BSP
21	09 05 114	1	..Steel ball 7/16" diameter
22	85 81 169	1	..Union 1/4" BSP - 1/4" BSP
23	85 82 041	2	..Taper plug 1/8" BSPT
	86 99 102		RAM 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

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