

# Standen



## **Statesman Two**

**Two Row  
Potato Harvester  
(from serial No. ST 501)**

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## INTRODUCTION

This manual provides the information for the operation, adjustment and maintenance of your **STANDEN STATESMAN TWO**. To enable you to achieve the best results from the machine, the manufacturer recommends that you read the manual thoroughly prior to using the harvester for the first time.

On taking delivery of your harvester, check that the machine is as ordered and that it has not been damaged in transit. Please report any shortfall to your Standen Dealer.

Adjustments to the harvester may have to be made singly or in combination according to crop and soil conditions. Always allow the machine to settle to a new setting before making further adjustments.

Throughout this manual, the terms 'front', 'rear', 'left hand' (LH), 'right hand' (RH) are derived from the tractor driver's position facing forward in the normal direction of travel.

Record below the details of your machine. Always quote the serial number when ordering spare parts.

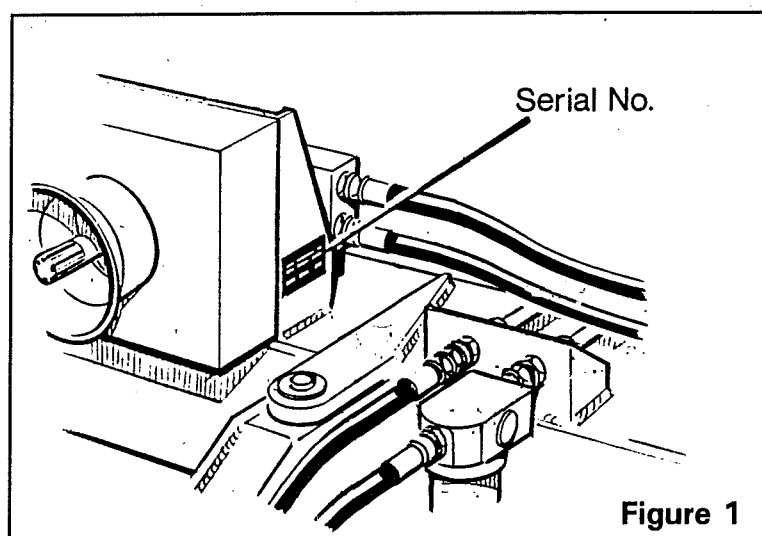


Figure 1

Date Purchased: \_\_\_\_\_

Date Started Work: \_\_\_\_\_

Machine Serial Number: \_\_\_\_\_

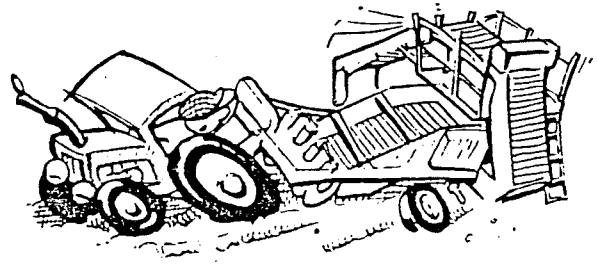
Agent's Name: \_\_\_\_\_

Agent's Address: \_\_\_\_\_

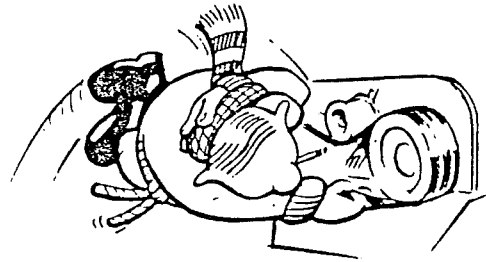
Agent's Telephone Number: \_\_\_\_\_

## SAFETY PRECAUTIONS

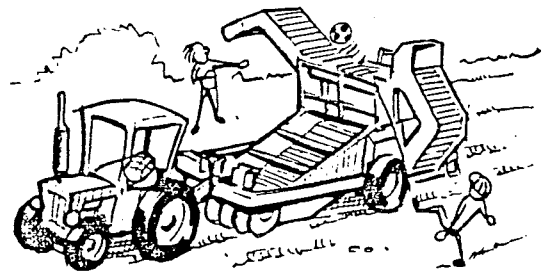
**NEVER:** Operate the machine in a state of disrepair.



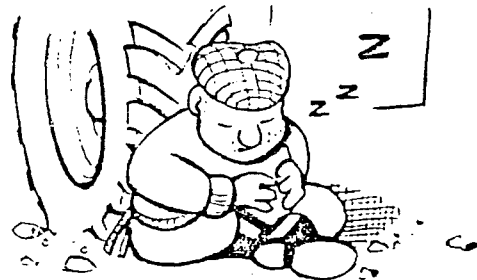
**NEVER:** Operate the machine with any of the safety guards removed. The guards are fitted for two reasons; to keep dirt out, and more importantly, to protect you and others from the various working parts. Make sure that the guards are kept in good condition and that they are fitted correctly at all times.



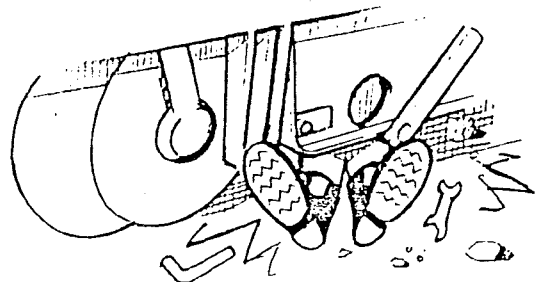
**NEVER:** Allow children in the vicinity where machines are working.

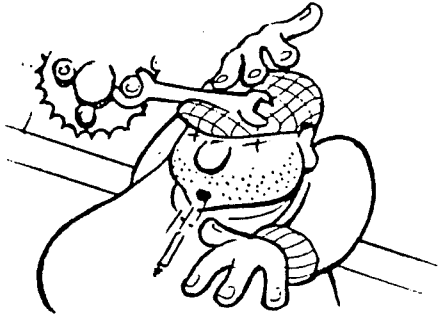


**NEVER:** Set machinery in motion before ensuring that everyone is aware of your intentions.



**NEVER:** Work under the machine when it is in the raised position on the tractor hydraulic lift linkage.

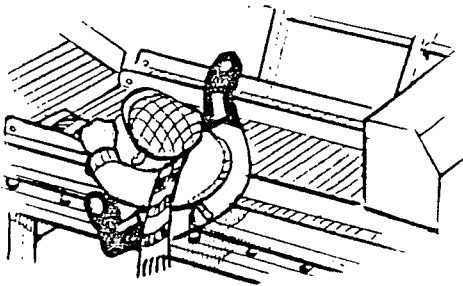




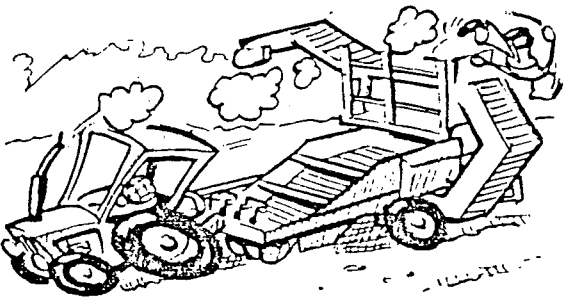
**NEVER:** Fit drive chains or drive belts while the drive sprockets or drive pulleys are in motion.



**NEVER:** Attempt to adjust or clean any part of the machine with the tractor power take-off in motion and always stop the tractor engine.



**NEVER:** Wear loose clothing and always tie back long hair whilst working on the picking area of the machine



**NEVER:** Operate the machine without giving prior notice to the pickers.

The above list of precautions is not exhaustive. All machinery is potentially dangerous and great care must be exercised by the operators at all times.

Standen Engineering Limited will not accept liability for damage or injury caused by their products except when such liability is imposed by English statute.

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# **Section 1**

## **Instruction Manual**

## INSTALLATION

The **STANDEN STATESMAN TWO** is a two row potato harvester designed to gently lift, clean and load potatoes into a trailer running alongside the harvester. The machine comes in two forms; a manned machine fully equipped with two platforms giving adequate room for up to six pickers to work in comfort, and an unmanned machine.

The tractor requirement for the Statesman Two is four wheel drive with 75hp for the unmanned machine and 95hp for the manned machine. In addition the Statesman Two requires a constant flow and return (6 gallons/minute) from the tractor hydraulics. All the hydraulic rams with the exception of one operate from the in-cab control box. The hydraulic ram that does not operate from the in-cab control box is the optional drawbar steer ram. This ram (if fitted) should be operated from the tractor double acting spool valve.

**NOTE:** Before operating the harvester check that the wheel nuts and sprocket keys are tight. Also check the bearing grub screws, especially before starting off with a new machine and during the first day or two of work.

**NOTE:** Never drop the machine quickly, lower gently.

**NOTE:** Pay attention to the lubrication and maintenance instructions included in this manual

**NOTE:** Pay particular attention to the safety precautions, they are written as a warning to protect you and others.

## TRACTOR WHEEL SETTING

Both the front and rear wheels of the tractor must be set to straddle the rows of potatoes. For example, if the crop is grown at 30" centres, then the distance measured between the tractor tyre centres must be 60" (152.4cm). This will ensure that the wheels run in the centre line between the rows of potatoes. The instructions for adjusting the tractor wheels are given in the tractor manufacturer's handbook.

**SAFETY FIRST:** When carrying out wheel adjustments, take care to place the jack under a solid part of the tractor. Before removing the wheels, place a stout support under the tractor frame in case the jack should become dislodged.

## CONNECTING THE HARVESTER TO THE TRACTOR

Level the harvester whilst standing it on a firm piece of ground and reverse the tractor up to it. Adjust the drawbar to align it with the tractor pick-up hitch ensuring that the towing eye is parallel with the ground. To adjust the towing eye, remove the twelve securing bolts (**item 1, figure 2**) and loosen the four pivot bolts (**item 2, figure 2**). Adjust the towing eye into one of the seven positions shown so that it approximately

aligns with the tractor pick-up hitch. Retighten the four pivot bolts and refit the twelve securing bolts. Pick up the harvester on the tractor pick-up hitch.

Once the harvester has been attached to the tractor, the hydraulics and electrics can be connected as described below.

1, Connect the hydraulic pressure hose (item 1, figure 3) (the hose connected to the pressure filter) to the tractor supply port. **The tractor must be set up to give a constant flow of 6 gallons/minute.**

2, Connect the hydraulic return hose (item 2, figure 3) to the tractor return port.

3, Connect the two hoses from the drawbar ram (item 3, figure 3), if fitted, to the tractor double acting spool valve.

4, Situate the in-cab control box in a convenient place inside the tractor cab.

5, With the tractor battery disconnected, connect the negative (-) blue lead from the in-cab control box to the negative (-) terminal on the battery and connect the positive (+) brown lead to the positive (+) terminal on the battery.

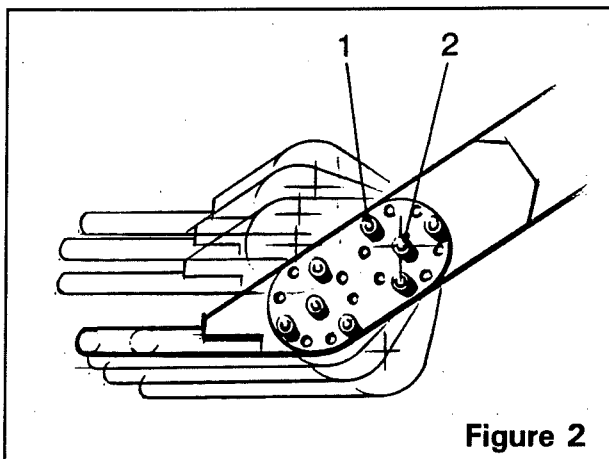


Figure 2

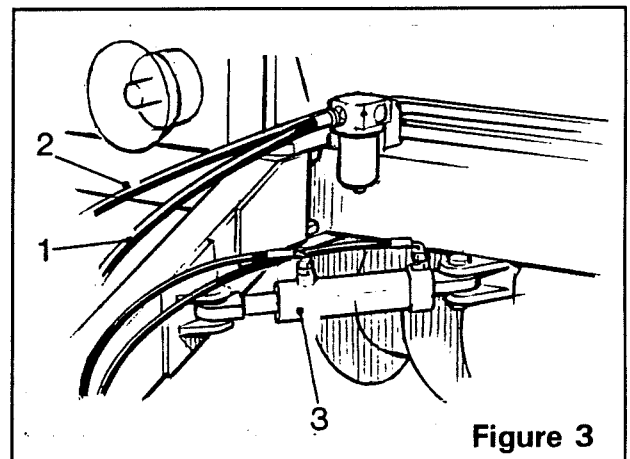


Figure 3

## PTO COUPLING TO TRACTOR AND HARVESTER

The PTO coupling supplied with the harvester may require cutting to the correct length to suit individual tractors. To do this, the coupling should be parted and the two ends fitted to the tractor and harvester respectively. The male and female shafts can then be measured alongside each other and an adjustment made by cutting the surplus bar from both the male and female shafts. **At least 4" (10cm) overlap should be allowed (see figure 4).** After the correct length of the coupling has been obtained, the PTO coupling guard should be cut to correspond with the coupling. Finally, before engaging the PTO, secure the guard by fixing the guard chain to a convenient place on the harvester.

## DRAWBAR

The drawbar is fixed to the machine by a pivot pin. This provides easy manoeuvrability of the harvester to align it with the crop. The adjustment is provided by an adjusting stay (item 1, figure 5) or an optional hydraulic ram (item 3, figure 3). To adjust the drawbar manually, simply turn the bar (item 2, figure 5). To adjust the drawbar hydraulically, actuate the double acting spool valve on the tractor.

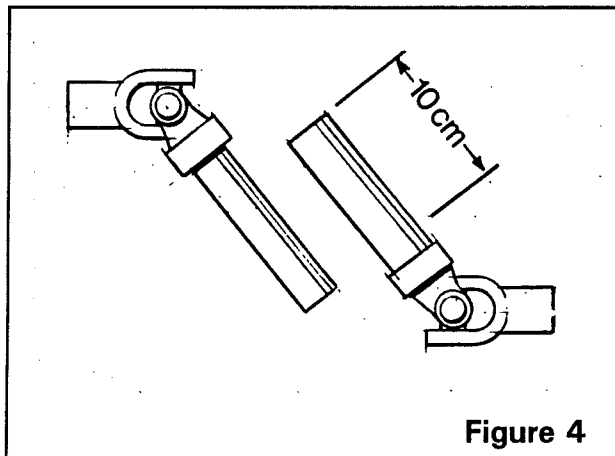


Figure 4

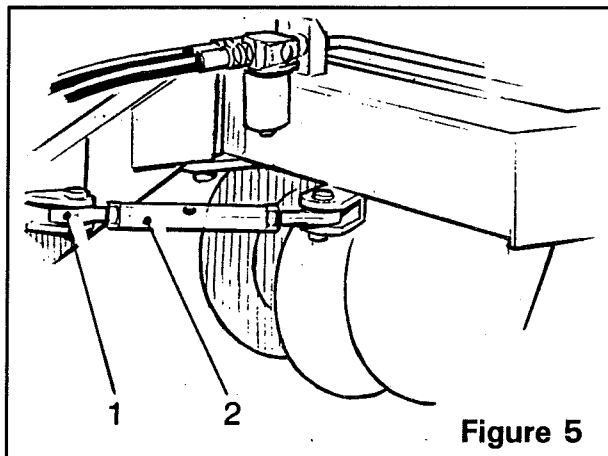


Figure 5

## FRONT ASSEMBLY

The front assembly, which includes the digger web, digger share, diablo rollers and disc coulters, is retained in the raised (transport) position by two locking pins (item 1, figure 6). The locking pins can be removed by turning them through 90°. Ensure the locking pins are relocated for transport.

The front assembly is hydraulically adjustable for height. To raise or lower the front assembly, move the switch on the in-cab control box marked 'Digger Share Raise/Lower' to the required position. Ensure that the locking pins (item 1, figure 6) are in the working position.

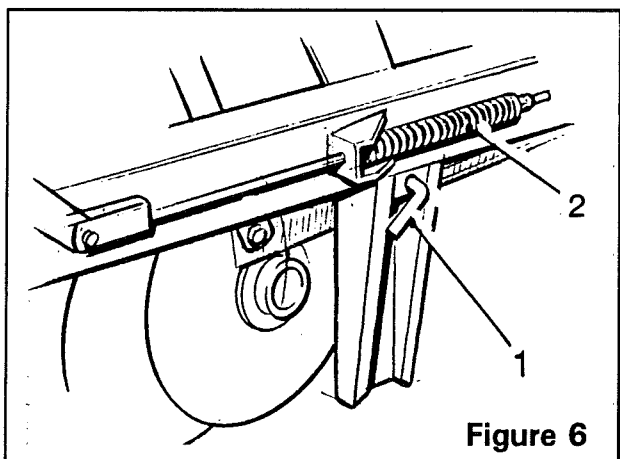


Figure 6

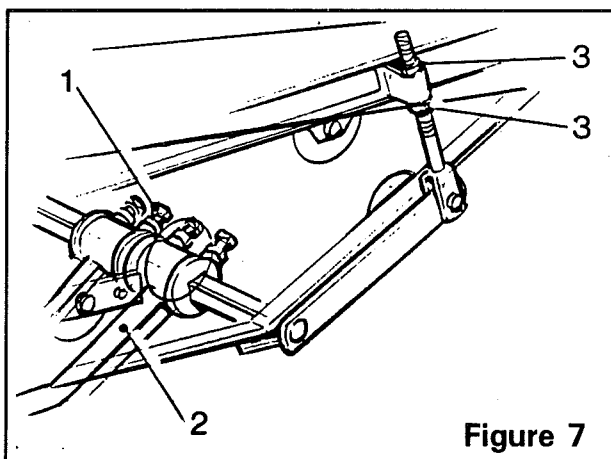


Figure 7

## SHARES

The digging shares are individually adjustable for 28" (70cm) to 36" (90cm) row spacings, with single or triple blade options. To adjust the shares for different row spacings, loosen the securing bolts (item 1, figure 7) and slide the share arms (item

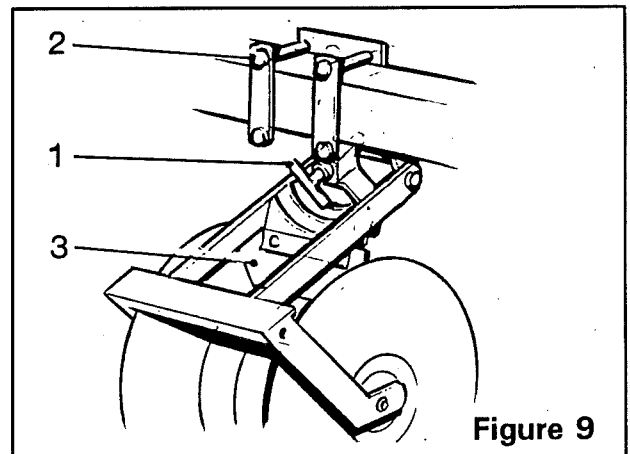
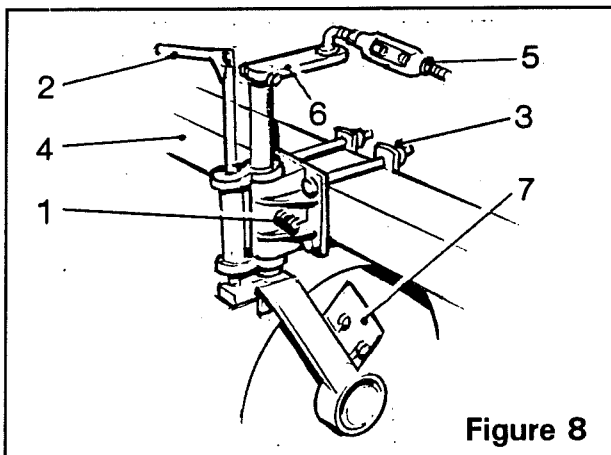
**2, figure 7)** along the mounting bar. Once in position, ensure that all of the securing bolts are retightened.

The digging angle of the shares can be adjusted by turning the adjusting nuts (**item 3, figure 7)** located on each side of the harvester. Ensure that both sides are adjusted equally.

## DISC COULTERS

The harvester is fitted with four 64cm diameter disc coulters, one on either side of the digger shares. The disc coulters are designed to cut down and part haulm and weed, whilst simultaneously feeding the ridge onto the digger web. The disc coulters are adjustable for depth of work and for different row settings. To adjust the discs for depth, loosen the locking bolt (**item 1, figure 8)** and turn the adjusting screw (**item 2, figure 8)**. When at the required depth, resecure the locking bolt if required (the locking bolt is fitted so that, if necessary, the disc coulters can be fixed to stop them from swivelling). To adjust for different row centres, slacken the four retaining bolts (**item 3, figure 8)** and slide the complete assembly along the support beam (**item 4, figure 8)**. The disc coulters can be adjusted for different row widths by slackening the four retaining bolts (**item 3, figure 8)** and removing the adjustable tie bar (**item 5, figure 8)** from the disc arm (**item 6, figure 8)**. Slide each disc assembly to the required position and retighten the retaining bolts. Finally, re-assemble the tie bar (**item 5, figure 8)** onto the disc arm (**item 6, figure 8)**. Once assembled, ensure the discs are tracked correctly (parallel to each other).

The disc coulters are fitted with scrapers (**item 7, figure 8)**. These must be kept as close to the disc as possible to enable their efficient operation.



## DIABLO ROLLERS

The diablo rollers control the digging depth whilst at the same time ensure even digging with the help of the compensator springs (**item 2, figure 6)**.

The diablo rollers are adjustable for depth of work and for different row centres. To adjust the depth of the diablo rollers, turn the adjusting screw (**item 1, figure 9)** until the rollers are at the required depth. To adjust the diablo rollers for different row

centres, loosen the four retaining bolts (item 2, figure 9) and slide the complete unit to the required position. Retighten the retaining bolts.

The diablo rollers are fitted with scrapers (item 3, figure 9). These scrapers must be kept as close to the roller as possible to enable their efficient operation.

## FRONT ASSEMBLY SETTINGS

As a general rule, heavy and/or stony conditions requires shallow digging, with the disc coulters set at minimum possible width and depth. The compensator springs (item 2, figure 6) should be slackened off enough to allow share penetration. Lighter soil requires deeper and wider width settings of shares and disc coulters to retain the soil. The compensator springs (item 2, figure 6) should be adjusted to allow them to transfer the weight of the digger assembly onto the main frame.

## DIGGER WEB

The digger web is 1520mm wide and is available in 28mm, 32mm, 36mm, 40mm, 45mm, 50mm pitches. The separation of soil from the crop can be increased or decreased by altering the movement of the agitator rollers (item 1, figure 10). This adjustment is carried out by actuating the hydraulic ram (item 2, figure 10). To adjust, move the switch on the in-cab control box marked 'Agitation Increase/Decrease' in the required direction.

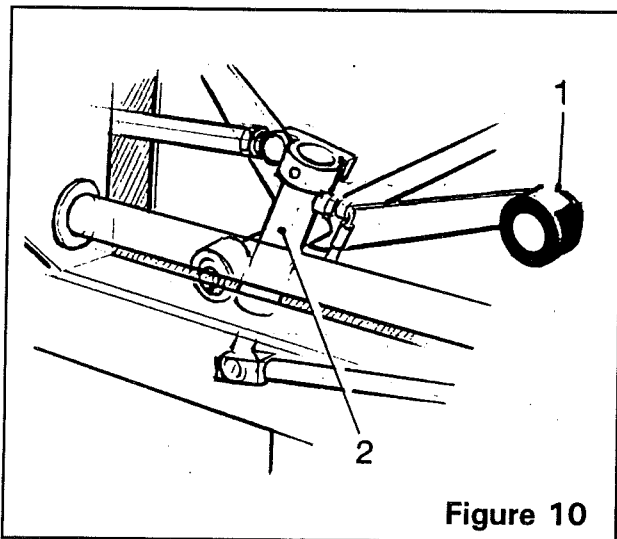


Figure 10

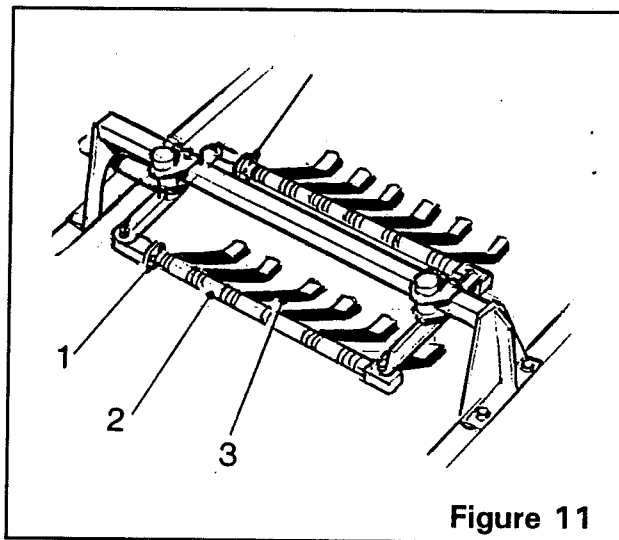


Figure 11

The optional sweeping clod fingers assist in separation. The sweeping clod fingers are fully adjustable for height so enabling the operator to vary the amount of separation. To adjust, loosen the four retaining bolts (item 1, figure 11) and pivot the support beam (item 2, figure 11) until the clod fingers (item 3, figure 11) are at the required height. Once in position, retighten the the retaining bolts.

**Care must be taken not to over separate, as this will cause potatoes to roll back down the digger web.**

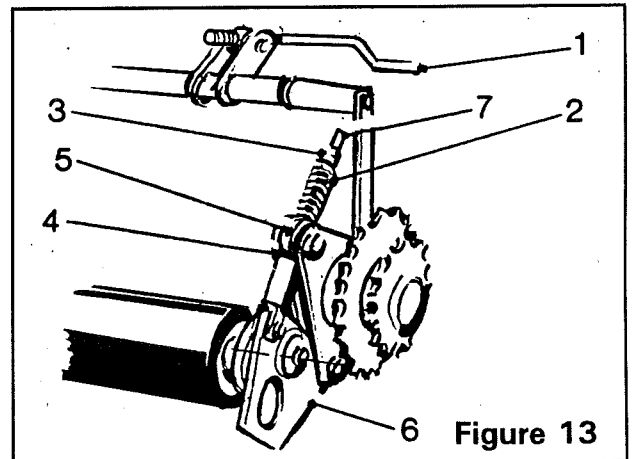
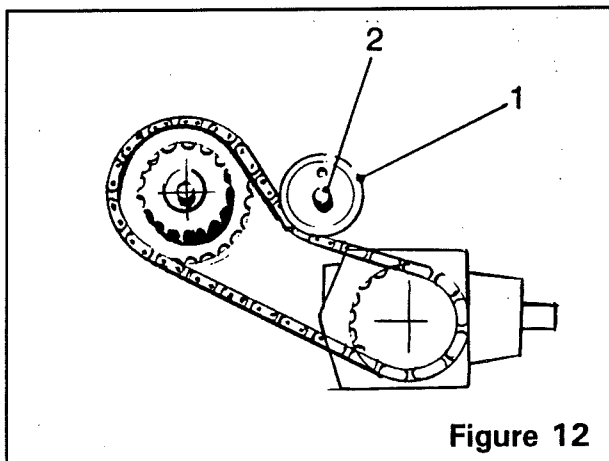
The digger web is driven by two sprockets and a drive chain. The chain is tensioned by a tensioner block (item 1, figure 12). To adjust, loosen the securing bolt (item 2,

figure 12) and slide the block to increase or decrease the chain tension. Once the correct tension has been achieved, resecure the block. Additional adjustment can be obtained by repositioning the securing bolt into the alternative hole in the tension block.

**SAFETY FIRST:** Before carrying out any adjustments or removing any guards, switch off the engine of the tow vehicle and apply the hand brake.

## HAULM ROLLER

The haulm removal roller is located behind the digger web. The roller is adjustable for height and tension. To adjust the height of the haulm roller, turn the handle (item 1, figure 13) in the required direction. The spring (item 2, figure 13) is used to tension the roller. The tension should be such that the roller is pulled back into position after a stone etc. has passed through. Too much tension makes the roller ineffective. To increase or decrease the tension of the haulm roller, turn the adjusting nuts (item 3, figure 13). The gap between the haulm roller and the digger web can be increased or decreased to allow for different field conditions. The roller is factory set to be as close to the digger web as possible. If any adjustment is required, add shims between the stop (item 4, figure 13) and the spring boss (item 5, figure 13). To add shims, remove the two adjusting nuts (item 3, figure 13) and the spring (item 2, figure 13) whilst simultaneously supporting the bottom of the mounting plate (item 6, figure 13). This operation is necessary at both ends of the haulm roller. Once the adjusting nuts and springs are removed, allow the mounting plate to swing down thus pulling the spring rod (item 7, figure 13) from the spring boss (item 5, figure 13). Add the necessary shims and re-assemble.



The position of the haulm roller in relation to the digger web is dependent on the crop conditions. The higher or further away the roller is positioned determines how much haulm and clod is taken out. If the haulm roller is set too high or too large gap exists, then there is a possibility that small potatoes will be lost.

Weighted haulm guides (item 1, figure 14) are fitted to guide haulm into the haulm roller. They can be adjusted by slackening the retaining bolt (item 2, figure 14) and pivoting the adjusting bar (item 3, figure 14) to the required position.

## SEPARATOR UNIT FEED WEB

The separator unit feed web has rubber covered bars to protect the crop and is fitted with a drop-away link to allow out any unwanted stones and clods etc. The function of the feed web is to transfer the crop from the digger web onto the separator unit.

The feed web is chain driven via a slip clutch, which is fitted to prevent damage should any blockage occur. The amount of torque required to start the clutch slipping can be varied by turning the six adjusting nuts (item 1, figure 15). The clutch should be set to just drive without slipping under normal conditions. **Over-tightening of the adjusting nuts will render the clutch ineffective.** Care should be exercised to ensure that all six nuts are adjusted equally. This is easily achieved by turning each nut one flat at a time. The feed web drive is taken from the digger web drive shaft via two sprockets and a drive chain. The chain is tensioned by a roller (item 2, figure 15). To tension the chain, loosen the locking nut (item 3, figure 15) and turn the adjusting nut (item 4, figure 15). When the correct tension is achieved, retighten the nuts

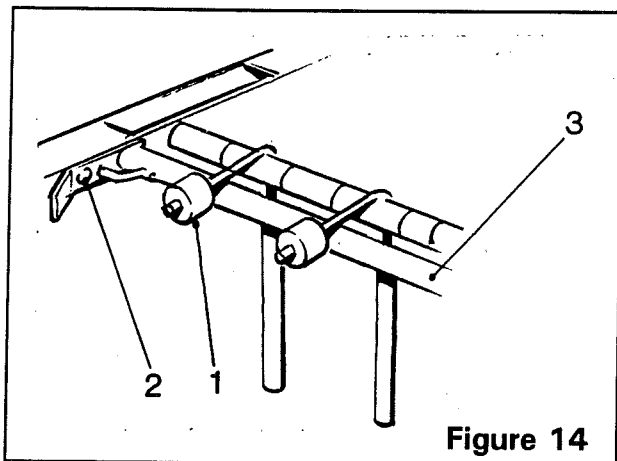


Figure 14

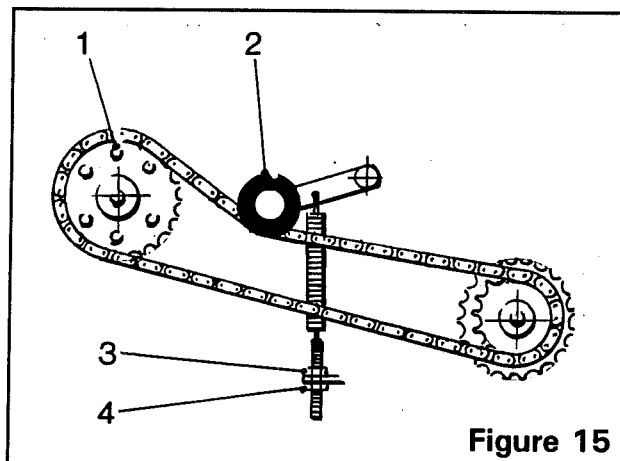


Figure 15

## ROLLER SEPARATOR UNIT

The roller separator unit consists of sixteen rubbered rollers mounted on solid steel shafts which are supported on taper roller bearings within the gear casing. The rollers are unrestricted at the discharge end to eliminate the possibility of blockage from loose clod and stone. The rollers are driven by a gear train, each pair of rollers contra-rotating to trap loose clod, stone and trash and eliminate them from the sample.

The gear train is driven by two hydraulic motors. The motors are powered by the independent hydraulic pump mounted on the front of the harvester and PTO driven.

The roller separator unit is designed to automatically reverse the roller direction for a few revolutions to release any object which cannot pass between the rollers, and then return the drive to the normal contra-rotating direction.

## ROLLER SEPARATOR UNIT SPEED CONTROL

The hydraulic pump (item 1, figure 16) produces a flow rate of 21 gallons/minute at 540rpm PTO speed. This flow allows for a maximum roller speed of 420rpm. The roller speed can be increased or decreased by operating the switch marked



**'Separator Speed Increase/Decrease'** on the harvester control box mounted at the rear of the machine. The switch activates the motorised flow divider (item 2, figure 16) mounted on the front of the harvester.

In general, the slower the roller speed, the longer the crop remains on the table and the greater the separation. However, especially with very small potatoes, if the rollers are slowed too much, then it is possible that potatoes will also be taken out with the trash. The speed setting is therefore very much determined by the crop and field conditions.

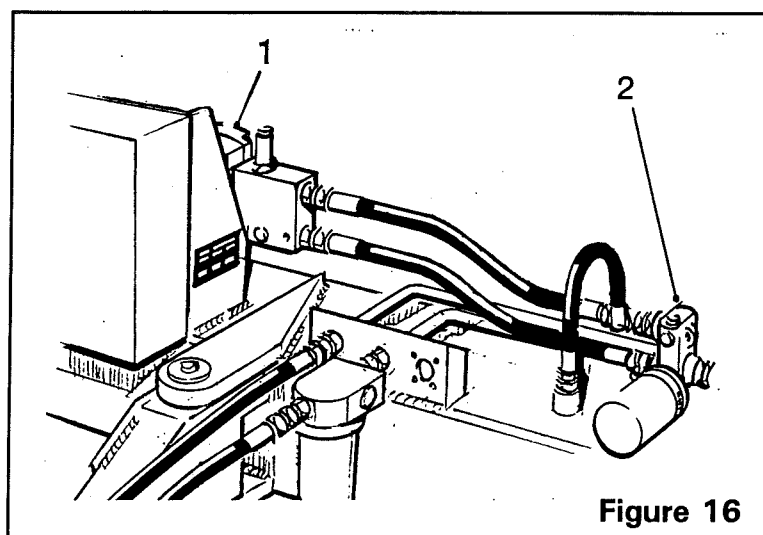


Figure 16

## ROLLER SEPARATOR UNIT ANGLE

The angle of the roller separator unit can be adjusted hydraulically from the in-cab control box and from the harvester mounted control box. To adjust the angle of the separator unit, operate the switch marked **'Separator Angle Raise/Lower'**.

By combining the roller speed control and angle control, suitable settings for optimum results in all field conditions can be achieved.

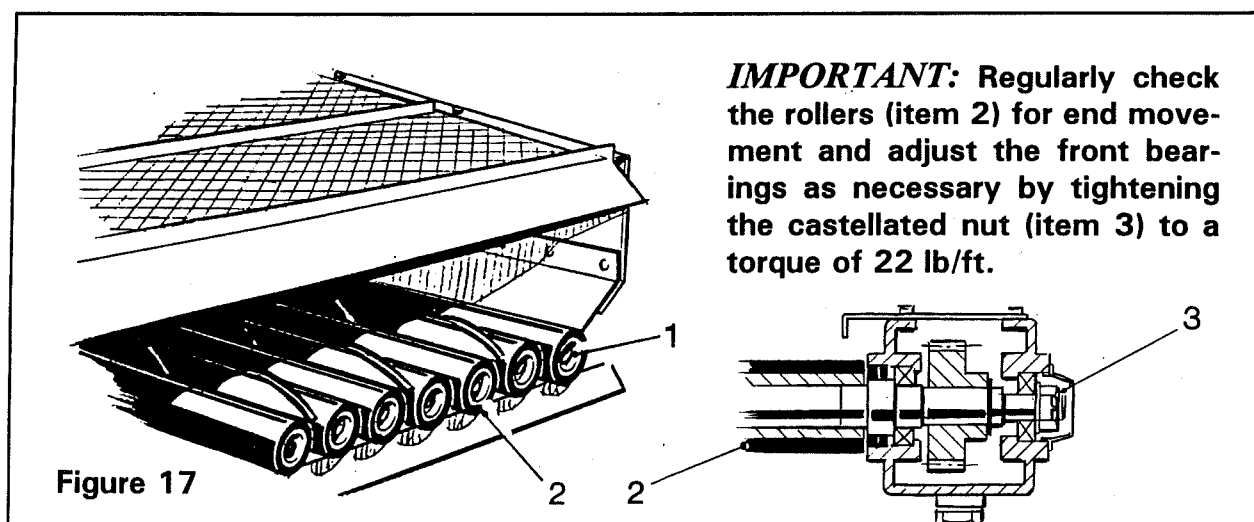
**WARNING:** When in operation, it is very important to ensure that all guards are in place. These rollers can cause serious or even fatal injury if in contact with limbs.

## ROLLER CHANGING

The separator unit is fitted with two types of roller, a 92.25mm ( $3\frac{3}{4}$ " ) diameter spiral roller and a plain roller. The plain roller can be supplied in two sizes, 82.5mm ( $3\frac{1}{4}$ " ) diameter where very small tubers need to be retained or 74.5mm ( $2\frac{15}{16}$ " ) diameter where maximum cleaning on heavy wet soil is required with a mature crop.

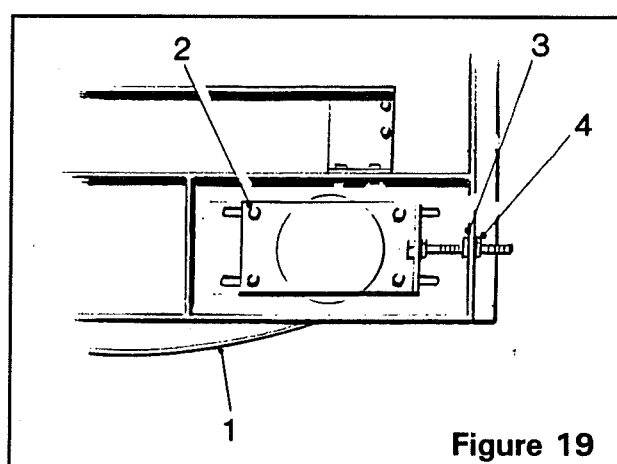
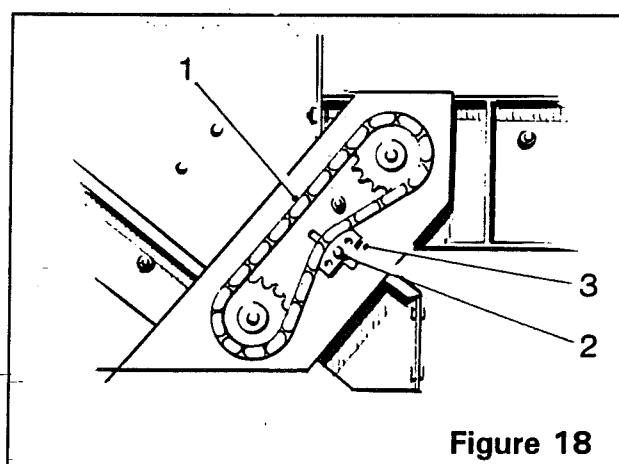
The rollers are retained on steel shafts by a single bolt and washer (item 1, figure 17) at the discharge end, and located on a spigot at the gearbox end. To remove a roller, remove the bolt and washer and slide the roller off the shaft. The rollers are a close

fit on the spigot and may need to be prised off in some cases. Replacement is the reversal of removal.



## DISCHARGE ELEVATOR/C'ELEVATOR FEED WEB

The elevator feed web transfers the crop from the roller separator unit to the discharge elevator (unmanned machine)/C'elevator (manned machine). The feed web drive is taken from the discharge elevator/C'elevator lower drive shaft via two sprockets and a drive chain. To adjust the tension of the drive chain (item 1, figure 18), loosen the securing bolt (item 2, figure 18) and slide the tensioner block (item 3, figure 18) in the required direction. Finally, retighten the securing bolt.



Adjustments in tension and tracking of the elevator feed web (item 1, figure 19) can be made by loosening the retaining bolts (item 2, figure 19) and the locknut (item 3, figure 19) and then turning the adjusting nut (item 4, figure 19). Adjust both sides equally to ensure the web runs centrally in the frame.

## DISCHARGE ELEVATOR

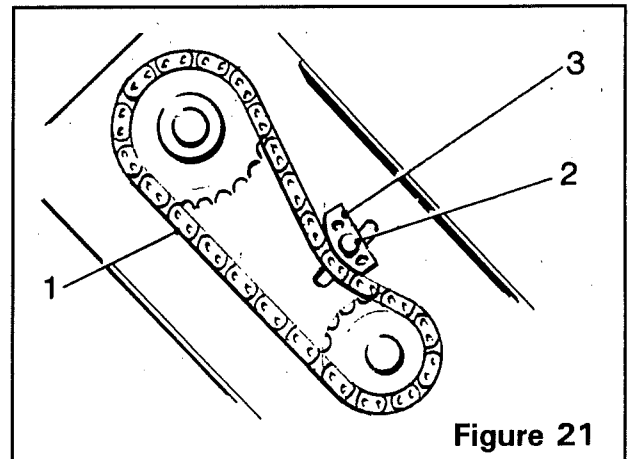
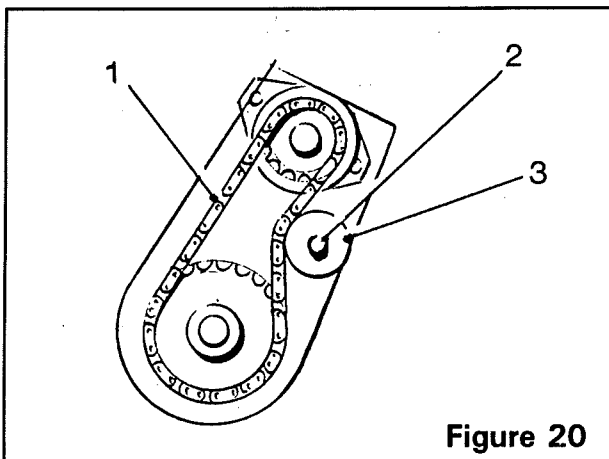
The discharge elevator is designed to provide easy folding from the working position to the transport position and vice-versa. To operate the discharge elevator, move the switch on the in-cab control box marked 'Discharge Elevator In/Out' in the required

direction. The discharge elevator top section can also be adjusted hydraulically to provide even filling of the trailer and keep the drop of potatoes to a minimum. To adjust, move the switch on the in-cab control box marked '**Discharge Elevator Raise/Lower**' in the required direction.

The discharge elevator web is driven by a hydraulic motor. To engage the discharge elevator drive, move the switch on the in-cab control box marked '**Discharge Elevator Run Auto/Stop/Run**' to the '**Run**' position. On machines fitted with automatic height control, the switch can be moved to the '**Run Auto**' position to engage the discharge elevator and activate the automatic height control. To stop the discharge elevator, move the switch to the '**Stop**' position.

On the unmanned machine, the speed of the feed web and discharge elevator web can be increased or decreased to suit crop conditions. To adjust the speed of the webs, turn the control knob on the in-cab control box marked '**Elevator Speed**'. The higher the number, the faster the webs will travel. **NOTE: Ensure that the proportional valve control knob (item 2, figure 27) is screwed fully out at all times.**

The discharge elevator drive chain (item 1, figure 20) can be adjusted for tension by loosening the retaining bolt (item 2, figure 20) and sliding the tensioner block (item 3, figure 20) in the required direction. Finally, retighten the retaining bolt.



### **C'ELEVATOR (manned machines only)**

The C'elevator is designed to transfer the potatoes from the elevator feed web to the picking table. The C'elevator, like the discharge elevator, is hydraulically driven and has soft rubber flights to minimise potato damage.

The C'elevator drive chain (item 1, figure 21) can be adjusted for tension by loosening the retaining bolt (item 2, figure 21) and sliding the tensioner block (item 3, figure 21) in the required direction. Finally, retighten the retaining bolt.

## PICKING TABLE (manned machines only)

The double platform allows up to six pickers to work in comfort, three on either side of the picking table. Two wooden rails are positioned above the picking table web to provide two moving reject belts. On the manned harvester, the C'elevator, picking table and discharge elevator are all hydraulically driven and can be varied in speed to suit crop conditions. To adjust the speed of the elevators, turn the control knob on the in-cab control box marked 'Elevator Speed'. The higher the number, the faster the webs will travel. **NOTE: Ensure that the proportional valve (item 2, figure 27) is screwed fully out at all times.**

**WARNING:** Care must be taken at all times when working on moving machinery. Never wear loose clothing and always ensure that long hair is tied back. People working on the harvester must be aware of the tractor drivers intentions.

The picking table drive chain (item 1, figure 22) can be adjusted for tension by loosening the retaining bolt (item 2, figure 22) and sliding the tensioner block (item 3, figure 22) in the required direction. Finally, retighten the retaining bolt.

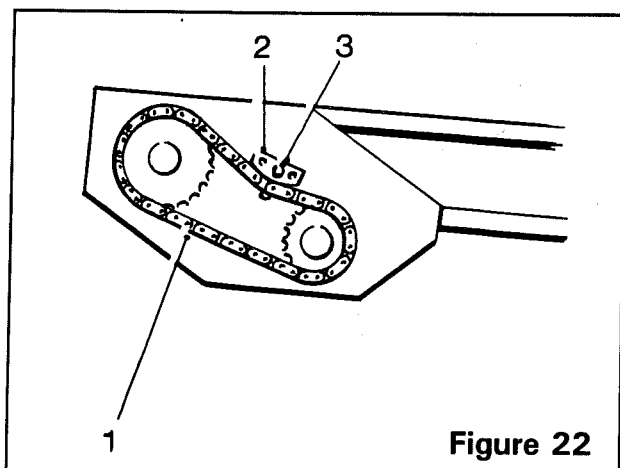


Figure 22

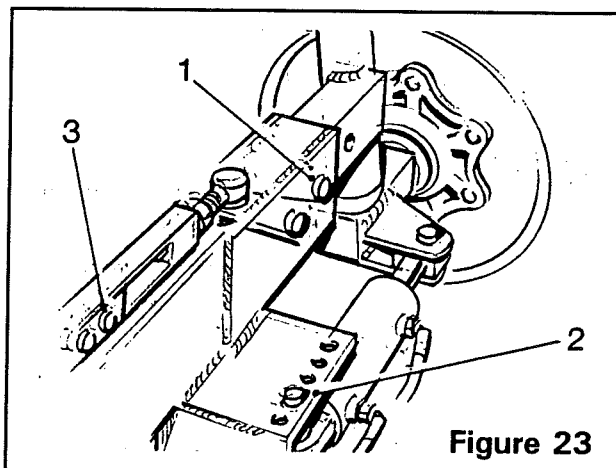


Figure 23

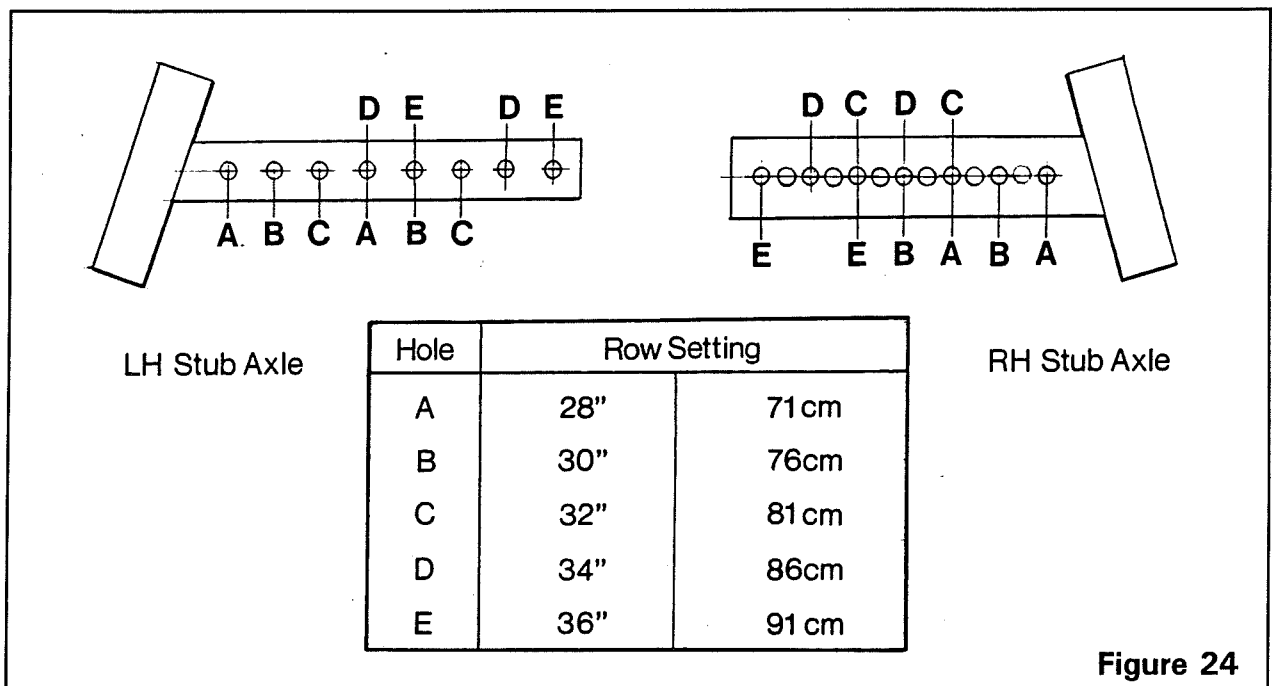
## REAR AXLE

The rear wheels are steerable to assist with hillside work and also enable easier headland turning. Operation of the rear wheels is controlled from the in-cab control box. To steer the rear wheels, simply move the switch marked 'Axle Steering Right/Left' in the required direction. The switch marked 'Axle Steering Centre', enables the operator to centralise the rear wheels automatically.

**SAFETY FIRST:** When carrying out wheel adjustments, take care to place the jack on firm ground under a solid part of the harvester. Before removing a wheel, place a stout support under the harvester frame in case the jack should become dislodged.

The rear wheels are adjustable for different row settings varying from 71cm (28") to 91cm (36"). To adjust the rear wheels:-

- 1, Jack up the machine.
- 2, Remove the axle bolts (item 1, figure 23).
- 3, Remove the ram bolt (item 2, figure 23).
- 4, Remove the retaining bolts (item 3, figure 23).
- 5, Slide the stub axles to the required position (see figure 24).
- 6, reposition all of the bolts in the correct holes (see figure 24).



The rear axle has been designed so that the angle of the machine can be altered in relation to the axle by a hydraulic ram. To adjust, move the switch on the in-cab control box marked 'Machine Level Raise/Lower'.

## MECHANICAL DRIVES

The various mechanical drives involved in the operation of the harvester consists of chains, sprockets, pulleys and belts. Each drive belt or chain has its own tension adjustment. The belts and chains should be tensioned correctly to ensure the efficient working of the machine. **It is important that the drive chains and belts are not over tightened, as this will cause excessive wear.** Instructions for the adjustment of each individual drive chain/belt is given in the paragraph relating to that assembly.

**WARNING:** All revolving drive machinery, chains, sprockets, pulleys, shafts etc. are potentially dangerous. Therefore, before attempting any adjustment or maintenance of the drive equipment, switch off the engine of the tow vehicle, disconnect the PTO shaft and set the hand brake. Failure to observe the above precaution could result in serious injury to personnel.

## MAIN DRIVES

The main drive is taken from the tractor PTO to a centrally mounted gearbox (item 1, figure 25) by a universal coupling. This shaft should be checked occasionally to ensure that the inner and outer tubes can slide freely, binding of the tubes will cause premature failure of the gearbox input bearings.

The hydraulic pump (item 2, figure 25) is driven from the gearbox (item 1, figure 25) and provides the necessary hydraulic oil pressure to drive the roller separator unit. The main drive is then taken from the gearbox input shaft via two triple pulleys and triple vee belt (item 3, figure 25) to the main drive shaft (item 4, figure 25). Besides providing a drive, the vee belts act as a slip clutch. It is therefore important that the belt tension is sufficient to drive normally without slipping, but not so great that the belt cannot slip when the drive is obstructed. To adjust the vee belt, loosen the retaining bolt (item 5, figure 25) and the locknut (item 6, figure 25). Turn the adjusting nut (item 7, figure 25) until the correct tension is achieved. Finally, retighten all bolts.

The main drive shaft (item 4, figure 25) transfers the the drive to the gearbox mounted on the RH side of the harvester. The gearbox oil level should be checked regularly and topped up if necessary with **EP90 Gear Oil**. From the gearbox, the drive is transferred forwards to drive the agitators and backwards to drive the digger web and separator unit feed web.

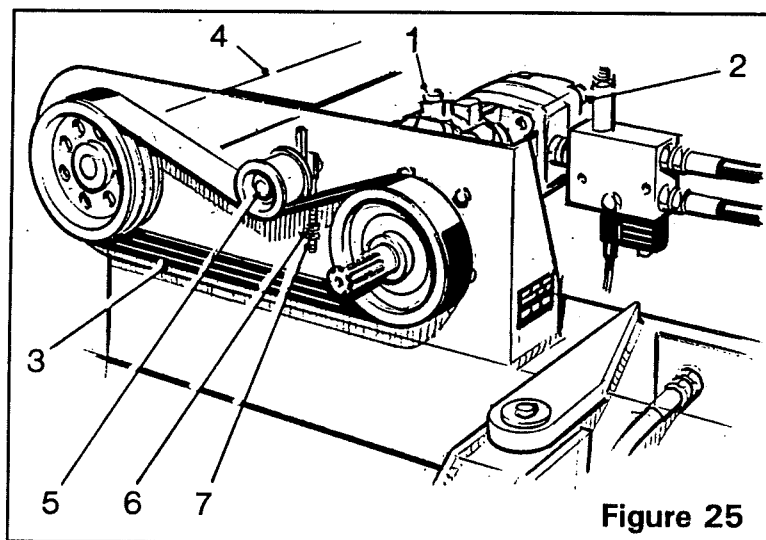


Figure 25

## ELECTRICAL CONTROL SYSTEM

The control for the major functions of the harvester are provided by the switches mounted on top of the in-cab control box and the harvester control box (see figure 26). Seven of these functions are operated by actuating individual hydraulic rams. The rams are actuated by a bank of solenoid valves (item 1, figure 27) mounted on the LH side of the machine. The remaining functions operated from the control boxes include; 'Discharge Elevator Auto Run/Stop/Run', optional 'Share Level Raise/Lower', optional 'Auto Level Off/On' and 'Separator Speed Increase/Decrease'. The 'Emergency Stop' button located on the harvester control box, when activated, shuts down

all hydraulic drive motors and sounds a warning buzzer on the in-cab control box. Once the 'Emergency Stop' button has been activated, the harvester hydraulic drive motors will not function until the button has been reset. **NOTE: The 'Emergency Stop' button does not isolate any mechanically driven components.**

Always disconnect the in-cab control box from the tractor battery when not in use, so avoiding the possibility of draining the battery.

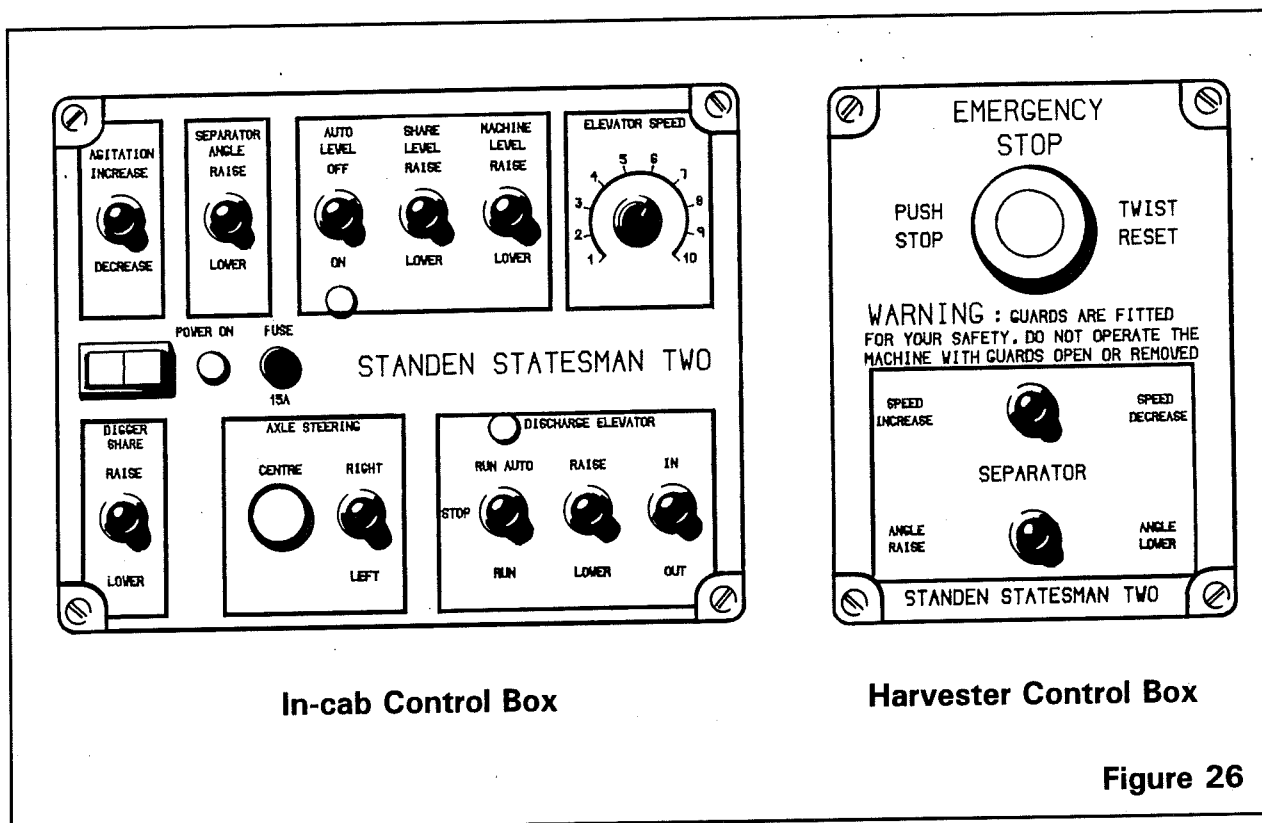


Figure 26

## HYDRAULIC SYSTEM

The hydraulic oil to operate the rams, discharge elevator, picking table and C'elevator motors is supplied directly from the tractor. Control for the hydraulic system is provided electronically from the in-cab control box and the harvester mounted control box. The only item requiring maintenance is the pressure line filter (item 1, figure 28). When the indicator (item 2, figure 28) is pointing to the red segment, the element (item 3, figure 28) will need to be replaced. To replace the element, simply unscrew it from the bottom of the filter assembly.

**WARNING:** Hydraulic pipes and fittings may be under pressure with the machine at rest. Ensure that all residual hydraulic pressure is released before disconnecting any pipework.

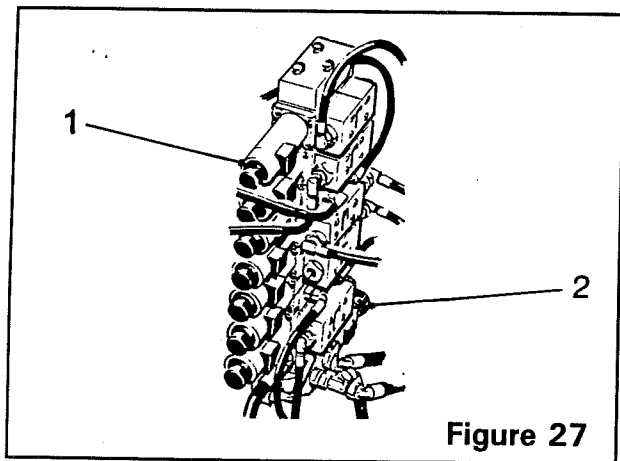


Figure 27

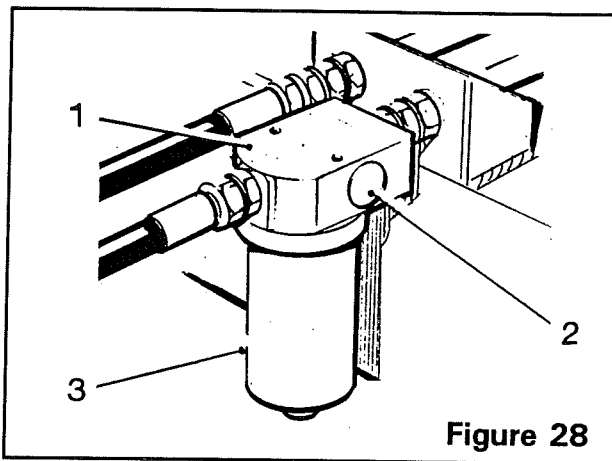


Figure 28

## SEPARATOR UNIT HYDRAULIC SYSTEM

The hydraulic pump (item 1, figure 29) produces 21 gallons/minute flow rate at 540rpm PTO speed. The oil reservoir is integral within the front and LH side frame members of the main frame and contains 32 gallons of hydraulic oil (**Nuto 46 Centistroke Oil**). The level is checked by the dipstick fitted within the filler/breather unit (item 2, figure 29) mounted on the front frame beam. The oil level must never be allowed to drop below the red mark.

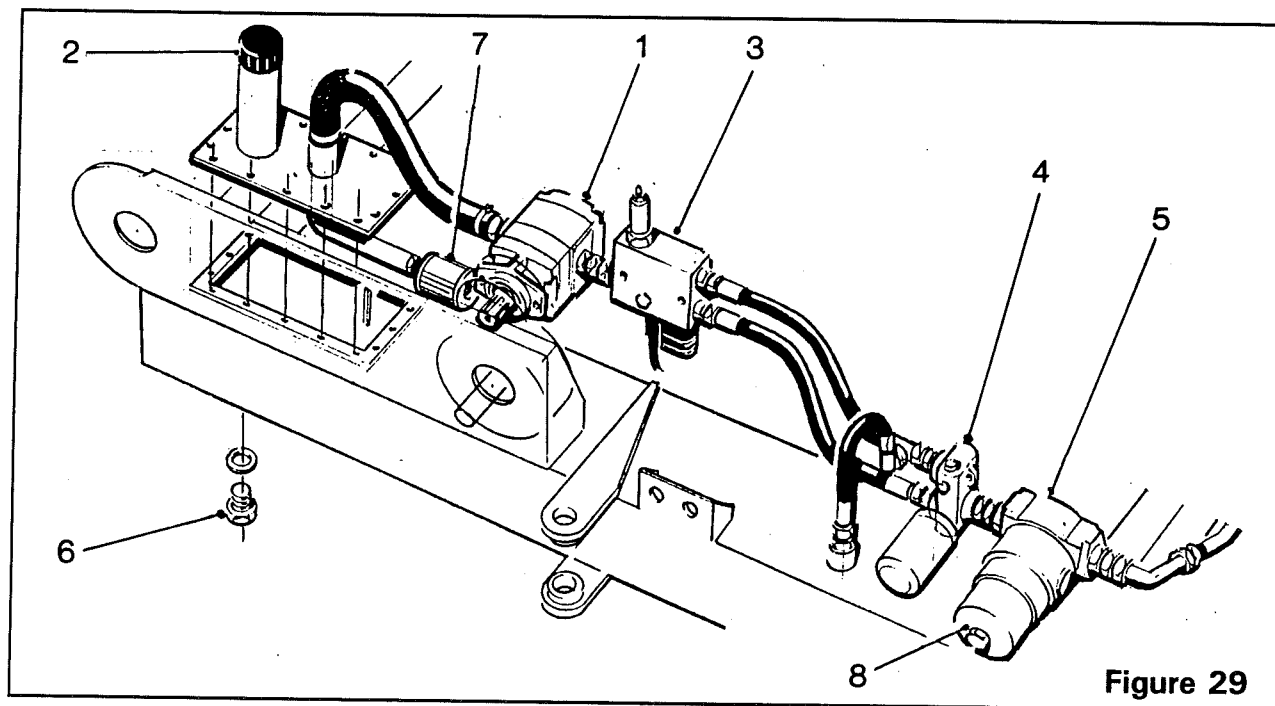


Figure 29

Pressurised oil passes through the system relief valve (item 3, figure 29) to the motorised flow divider (item 4, figure 29) which controls the speed of the separator unit motors. From the flow divider, the oil passes through the pressure filter (item 5, figure 29) and then travels to the reversing valve unit (item 1, figure 30). The reversing valve unit is designed to automatically reverse the separator unit roller direction for a few revolutions to release any object which cannot pass between the rollers, and then return the drive to the normal contra-rotating direction. The return oil from the separator unit motors passes back through the reversing valve unit and then returns to the main frame reservoir. The only items requiring maintenance are the pressure filter (item 5, figure 29) and the oil reservoir strainer (item 7, figure 29). The pressure

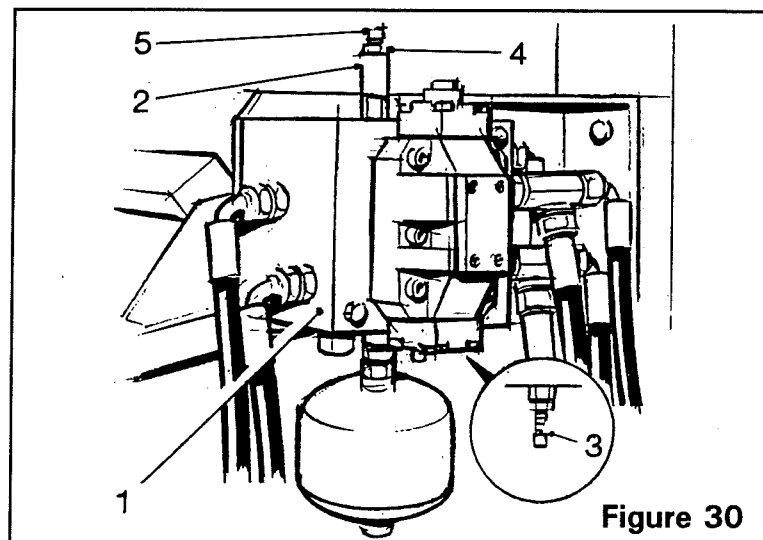


filter element (item 8, figure 29) should be replaced after the first 50 hours running and annually thereafter. The oil reservoir strainer (item 7, figure 29) should be removed and cleaned annually.

**WARNING:** The pressure relief valve (item 3, figure 29) is fitted to protect the hydraulic system should any major blockage occur. It is an essential safety feature preset at the factory and should never be tampered with.

## REVERSING VALVE UNIT

The reversing valve unit (item 1, figure 30) is fully automatic in its operation. The reversing is actuated by the sequence valve (item 2, figure 30) mounted on top of the reversing block. When an object starts to block the separator unit rollers, the operating pressure increases to the preset pressure of the sequence valve. Once this pressure is reached, the valve reverses the separator unit motors for a preset time, this time being controlled by the small bleed screw (item 3, figure 30) mounted beneath the valve block. This is factory set and in normal circumstances should not need altering. To increase the delay period, the bleed screw (item 3, figure 30) is screwed in, but care should be taken not to screw in fully as this will cause the rollers to stay in reverse.



The sequence valve (item 2, figure 30) is preset to operate at 1450psi. In exceptionally stony or trash conditions, this setting may need to be increased to avoid the separator unit rollers from reversing too often. The pressure is increased by slackening the locknut (item 4, figure 30) and turning the top screw (item 5, figure 30). This must be done with a pressure gauge and throttle valve fitted between the pressure port of the reversing valve unit and the tee connection which separates the oil flow to the two motors. Should this equipment not be available, then consult your dealer. **THE SEQUENCE VALVE SETTING MUST NEVER EXCEED 1800psi.**

Should the occasion arise that a blockage occurs where the object jams the rollers such that motors cannot reverse, then the tractor PTO must be disconnected from the drive to the hydraulic pump and the object removed manually.

## MAINTENANCE OF THE HYDRAULIC SYSTEMS

The components utilised in the design of the hydraulic systems have been chosen for their maintenance-free characteristics. The only components requiring any maintenance are the following:-

A, The pressure filter element (**item 3, figure 28**) should be replaced when the indicator (**item 2, figure 28**) is pointing to the red segment. To replace the element, simply unscrew it from the bottom of the filter unit.

B, The pressure filter elements (**item 3, figure 28 and item 8, figure 29**) should be replaced after the first 50 hours running time.

C, Every 500 hours running time or annually, replace the pressure filter elements (**item 3, figure 28 and item 8, figure 29**). Drain the hydraulic oil reservoir and clean the magnetic plug (**item 6, figure 29**). Remove and clean the oil strainer (**item 7, figure 29**). Refill the hydraulic reservoir with **Nuto 46 Centistroke Oil** (32 gallons).

D, Check the machine for perished or chafed hoses and replace.

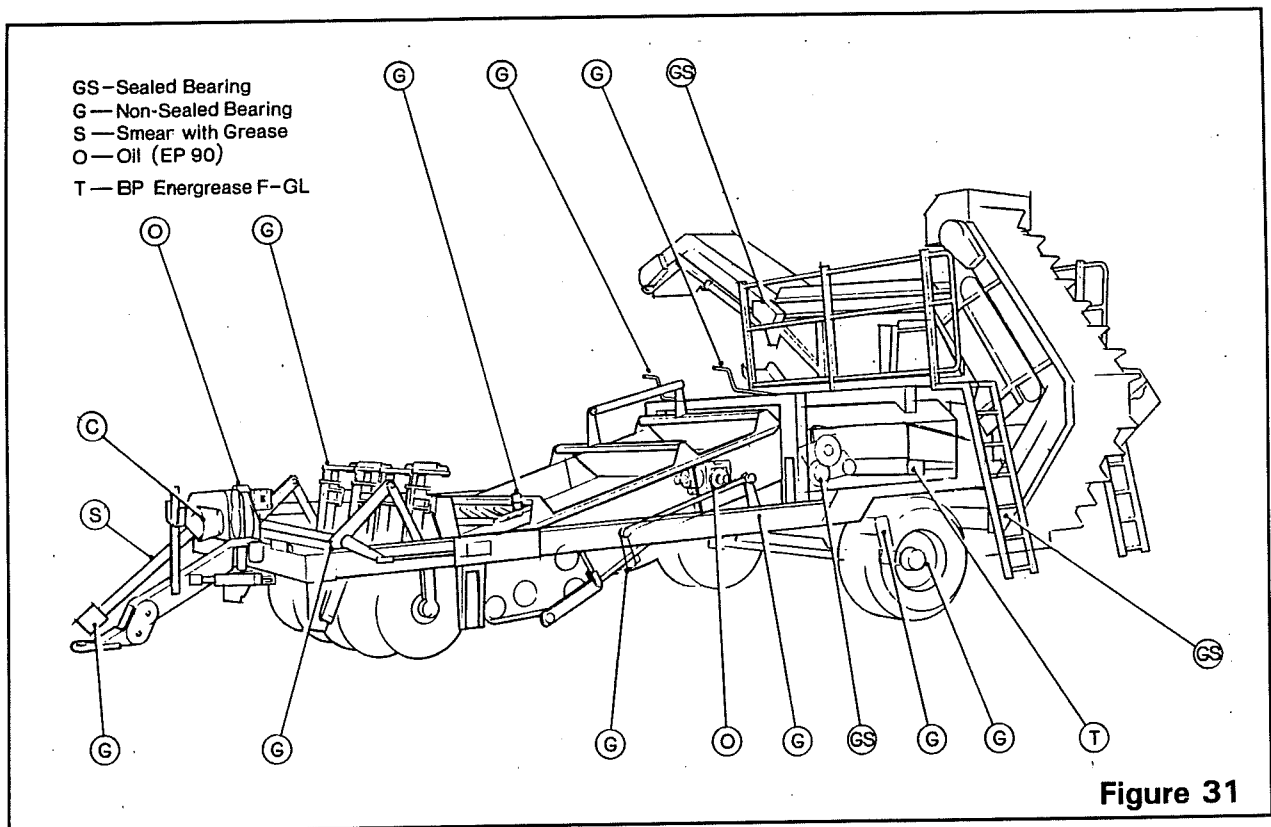
**WARNING:** When carrying out maintenance on the hydraulic system, cleanliness is of the utmost importance. Avoid any dirt entering the system.

## MAINTENANCE AND LUBRICATION

Regular maintenance will ensure that the harvester provides a long and efficient service life. Depending on soil and weather conditions, the maintenance time schedule can vary. However, it is recommended that the machine be lubricated and the gearbox oil levels checked once a week throughout the season.

Correct lubrication should be employed to ensure the full life of the various working parts and the efficient operation of the machine. A general purpose grease should be used for the bearings and the universal coupling drives. The non-sealed bearings (**ref.G, figure 31**) should be greased at least once a day. It should be noted that some of the bearings are sealed and pre-lubricated (**ref.GS, figure 31**). Care should be taken not to flood these bearings with grease or the seals may burst allowing the grease to escape and dirt to get in. Should this happen, more frequent greasing will be required to keep the dirt at bay. When lubricating sealed bearings, only two or three strokes of the grease gun every twenty acres of work is required. It is recommended that the universal couplings be dismantled periodically and their shafts smeared with grease. All drive chains should be kept well greased. The gearbox (**ref.O, figure 31**) should be checked regularly and topped up with **EP90 Gear Oil** as necessary. The separator unit gearbox (**ref.T, figure 31**) should be checked regularly and topped up with **BP Energrease F-GL** as necessary.

Particular care must be taken to ensure that grease or oil does not come into contact with vee belts or clutches.



## ROLLER SEPARATOR UNIT OIL SEAL REPLACEMENT

The separator unit roller shafts (item 1, figure 32) are each fitted with two oil seals (item 2, figure 32) at the gearbox end (one behind the other). The seals prevent oil from escaping the gearbox housing and also prevent dirt from entering.

Depending on conditions, the oil seals (item 2, figure 32) may eventually become worn or damaged and begin to leak. At this point the oil seals will need to be replaced.

### Removing the worn oil seals

1, The rollers are retained on the steel roller shafts (item 1, figure 32) by a single bolt and washer at the discharge end. Remove the bolt and washer and slide the roller off the discharge end of the shaft. The rollers are a close fit on the shaft and may need to be prised off in some cases.

2, Prise out the damaged oil seals, 2 off (item 2, figure 32), from the gear housing taking care not to scratch the seal apertures. Remove any dirt deposits.

### Fitting the new oil seals using the seal insertion kit

1, Grease the inner and outer faces of the new seals to be fitted.

2, Push one of the seals into the compression ring (item 3, figure 32) so that the seal protrudes 1-2mm beyond the ring face (see figure 32).

3, Locate the seal in the gear housing aperture and hold the ring firmly against the housing face.

4, Press the seal firmly home by sliding the hammer (item 4, figure 32) along the roller shaft.

5, Repeat for the second seal.

6, Reassemble the roller onto the roller shaft and replace the bolt and washer.

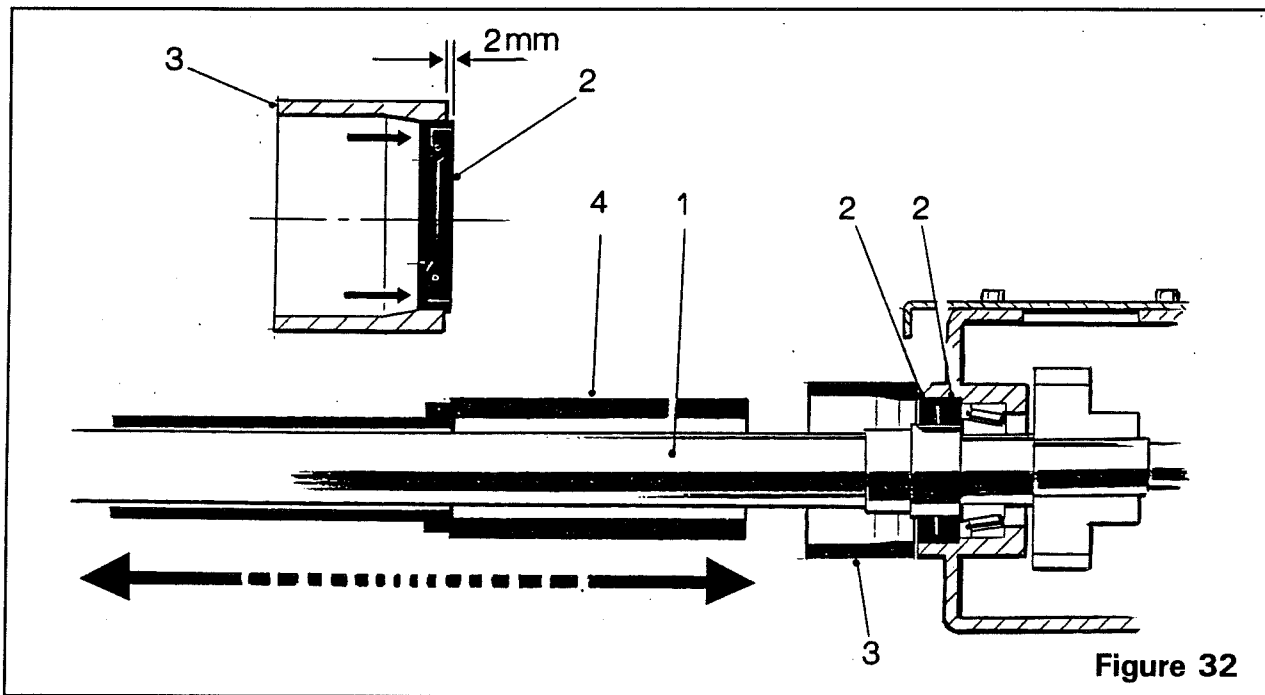


Figure 32

## REPLACEMENT WEB BELT DRIVING BLOCKS (supadrive webs only)

In the event of a web belt drive block being damaged to the extent that a loss of web drive is experienced, the damaged blocks can be replaced with steel blocks as described below:-

1, Remove the damaged block to leave the surface of the belt flat and free from loose rubber.

2, Drill or punch two holes 6mm diameter in the belt to the dimensions shown.

3, Screw the block (item 1, figure 33) into place ensuring the countersink on the screw (item 2, figure 33) is compressed as far as possible into the rubber belt top surface.

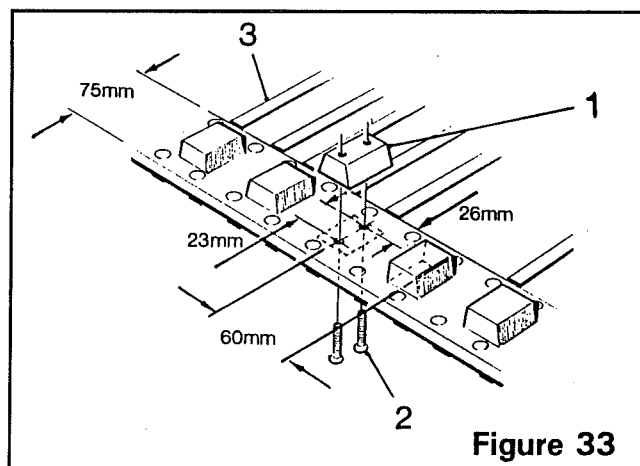


Figure 33

4, It is essential that the pitch of 60mm between the block centres is maintained to ensure mating in the drive sprocket. If the position of a rod (item 3, figure 33) coincides with the required position of the holes for fixing the block, then the rod must be removed and re-riveted after fixing the block.

## **SPLIT SPROCKETS**

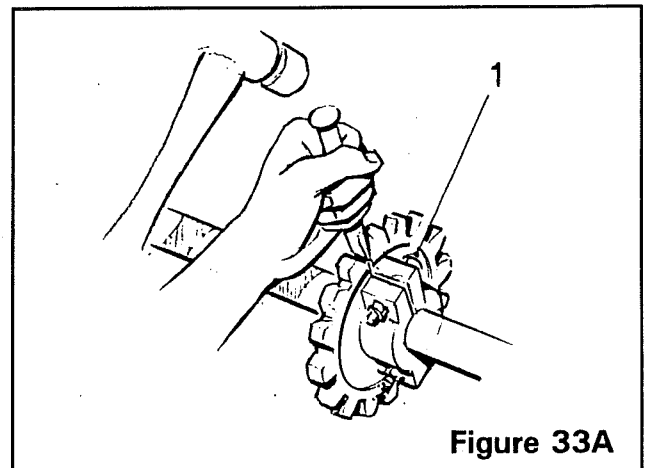
Split sprockets are used on some of the harvester web drive shafts. These sprockets have been designed to simplify maintenance work. Rather than dismantling a complete drive assembly, the web sprockets can be split and removed from the drive shaft as described below:-

### **Sprocket removal**

- 1, Remove the fixing bolts (item 1, figure 33A).
- 2, Using a hammer and chisel, split the sprocket along the groove provided.
- 3, Remove the sprocket from the shaft.

### **Sprocket replacement**

- 1, Mark each half of the new sprocket before splitting.
- 2, Using a hammer and chisel, split the sprocket along the groove provided.
- 3, Locate the sprocket on the shaft and secure using the fixing bolts (item 1, figure 33A).



## **LAYING UP THE HARVESTER AT THE END OF THE SEASON**

- 1, Clean the machine down thoroughly.
- 2, Check for any worn parts and order spares in good time.
- 3, Protect all bright surfaces with rust preventative or grease.
- 4, Oil the drive chains or remove and store them in a suitable liquid (diesel or paraffin).
- 5, Grease all bearings.

## **CHECKS BEFORE STARTING A NEW MACHINE, STARTING IN A NEW FIELD OR VARIETY, OR STARTING WITH A NEW TRACTOR**

- 1, Ensure that the harvester is level when hitched to the tractor.
- 2, Ensure that the tractor and harvester wheel tracks match the rows to be harvested.
- 3, Ensure that the return oil flow from the harvester to the tractor is unrestricted. On several makes of tractor this will require particular attention.
- 4, Set the drawbar ram (if fitted) in the middle of the ram stroke.
- 5, Set the shares with a 1" gap between each share.
- 6, Check that the distance between the middle point of each set of shares matches the width of the rows.
- 7, Check that the middle point between the two sets of shares is in the middle of the digger web.
- 8, Set the share arms so that the shares and tip plates are in line with the top of the digger web.
- 9, Set the diablo roller adjusters in the middle of the thread.
- 10, Ensure that the centre of the diablo roller is over the centre of the shares.
- 11, Ensure that the discs coulters are sharp (in soft going).
- 12, Set the disc coulters 1" above the shares and 1" either side of the shares (lower after the digging depth has been obtained).
- 13, Ensure that the disc coulters are parallel to one another.
- 14, Ensure that the haulm intake rollers clear the disc coulters, but with a gap no wider than 1 1/2".
- 15, Ensure that the outer haulm intake rollers are under tension.
- 16, Set the compensator springs on either side of the mainframe to show 3" of exposed thread.

## **SETTING THE MACHINE INTO WORK**

- 1, Set into work, travel a few yards and stop.
- 2, Dig into the rows behind to check for depth of work.

Cut potatoes in the soil indicates that the digging is too shallow. However, check that the cut is caused by a share (uneven cut, often curved) and not by a disc (a clean, flat cut). Only increase the depth of digging if the cut is caused by a share.

If digging too deep, too much soil will be carried on the webs ( $1/2$ " = 30 tons of soil per acre) resulting in more wear and a harder job of separation. Set to as shallow as possible.

Set the bottom of the disc coulters to the depth of the shares.

Once the depth is correct, tighten the compensator springs to reduce the weight of the diablo rollers on the ridges.

### **3, Check the potatoes on the digger web for cuts.**

If a clean slice is visible, it has probably been caused by a disc coulters. Set the appropriate disc to a wider position, not forgetting to adjust the tie bar to keep the discs parallel. Beware widening too far thus opening too wide a gap between share and disc. If the slice is curved, it has probably been caused by the shares digging too shallow. Dig deeper.

### **4, If undamaged potatoes are lying on the ground:**

The pitch of the digger web may be too large. Fit a web bar cover kit, or change to a smaller pitch web.

The Disc coulters may be set too far from the haulm intake rollers (or the web side on 36" rows). Adjust the disc coulters. On the middle pair of haulm intake rollers, there are three available widths of axle shaft. In extreme cases, it may be necessary to change to a different axle shaft.

The shares may be set too far apart.

There may be too much agitation on the digger web.

The sweeping clod fingers may be set too hard against the digger web

The haulm roller may be set too low or too high.

### **5, If crushed potatoes are lying on the ground:**

Crushed potatoes can indicate an incorrectly set haulm roller. Check that the haulm roller is set as close as possible to the web but is not actually touching it (check both ends). Add or remove spacers to adjust. Fitting or removing a web bar cover kit necessitates adjusting the haulm roller clearance. Fitting a half web bar cover kit causes 'pockets' and should be avoided on small potato samples.

Ensure that the haulm roller is under spring tension to avoid bouncing. Tighten the springs on the adjusters.

Set the height of the haulm roller (using the adjusting handle) to give the best haulm removal without potato loss.

Check that the haulm roller scraper is set close to the roller.

Set the weighted haulm guide fingers to just clear the web.

Check for bent web bars on the digger web

**6, If Crushed potatoes are lying under the roller separator unit:**

Increase the speed of the separator unit rollers.

Increase the angle of the separator unit.

Carry more loose soil onto the separator unit

If small diameter plain rollers are fitted, change to large diameter rollers.

In exceptionally dry conditions consider fitting a roller moisturising kit.

## **GENERAL OPERATING HINTS**

- 1, Carry soil to the top of the digger web whenever possible.
- 2, Use as little web agitation as possible.
- 3, Use the harvester levelling control to keep the machine as level as possible.
- 4, Set the discharge elevator speed as slow as possible but not so slow as to cause 'water-falling'.
- 5, Set the roller separator unit angle as steep as possible. Reduce the angle for more cleaning.

## **TROUBLE SHOOTING**

<b>Problem: Bruised potatoes in the trailer.</b>
--

Cause.	Solution.
1, Potatoes already bruised in the ground by previous field work.	Change operating methods.
2, Compensator springs too slack, causing excess diablo roller weight on ridge.	Increase spring pressure, but not so far as to lift the shares above the set depth.
3, Share angle too steep, or back of share too low, causing boiling in front of the digger web.	Adjust as necessary.
4, Share arm bent, causing excess potato pressure against that share.	Replace share arm.



**Cause.**

5, Bruising caused by web roll back.

6, Rubber clod breaking fingers (if fitted) set too hard against the digger web.

7, Haulm roller nipping the potatoes.

8, Separator unit rollers causing bruising (unlikely except in very dry conditions).

9, Discharge into trailer is too severe.

10, Tractor or harvester wheels running against next unharvested row.

**Solution.**

Carry more soil onto the digger web by travelling faster, slowing the web, or reducing agitation. Consider fitting sweeping clod fingers to spread the soil.

Slacken pressure.

Adjust the roller.

Check settings.

Slow down the discharge elevator. Improve trailer loading technique.

Adjust wheels or fit narrow wheels.

<b>Problem: Poor soil flow onto the digger web.</b>
---

**Cause.**

1, Diablo rollers causing too much pressure on the ridge.

2, Diablo rollers set too far forward or too far back.

3, Share angle too steep.

4, Disc coulters are not rotating.

5, Share tip-plates are stuck up.

6, Haulm hanging up in front.

**Solution.**

Tighten the compensator springs.

Adjust as necessary (one of the three positions).

Adjust as necessary.

Set the disc coulters deeper. Adjust the tie bar to give a small degree of toe-in.

Free off. Ensure that the tip plates are free to rise and fall.

Sharpen the disc coulters. Check the haulm intake rollers for spring pressure. Check that the rollers are free to rotate.

### **Problem: Malfunctioning hydraulics.**

#### **Cause.**

- 1, Back-pressure from the tractor hydraulics interfering with oil flow.
- 2, Pressure filter needs changing.
- 3, Loose contacts in the multi-pin connector.

#### **Solution.**

- Ask your dealer to fit the necessary low pressure return flow kit.
- Replace the filter element.
- Check all pins connecting with opposite sockets.

### **Problem: Discharge elevator will not run.**

#### **Cause.**

- 1, Proportional valve control knob has been screwed in.
- 2, Loose contacts in the multi-pin connector.
- 3, 'Elevator speed' control knob mounted on the in-cab control box has not been set to match with the proportional valve.

#### **Solution.**

- Screw the proportional valve control knob fully out.
- Check all pins connecting with opposite sockets.
- Adjust as described below.

### **'Elevator speed', adjustment procedure.**

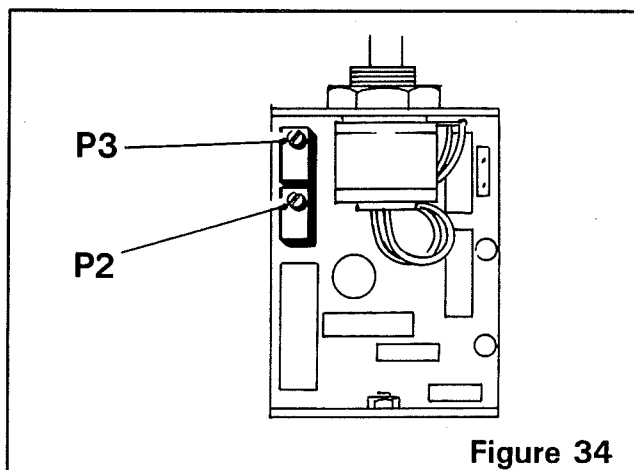
To match the 'Elevator speed' control knob on the in-cab control box to the proportional valve (**item 2, figure 27**), it is necessary to adjust the variable preset potentiometer on the control card mounted beneath the speed control knob (**see figure 34**). Ensure that the proportional valve control knob is screwed fully out.

#### **1, To set the minimum speed.**

With the elevator running and the in-cab control box 'Elevator speed' control knob turned to just on (**position 1**), adjust the screw marked '**P2**' to decrease the speed until the elevator is just running.

#### **2, To set the maximum speed.**

With the elevator running and the in-cab control box 'Elevator speed' control knob turned to maximum (**position 10**), adjust the screw '**P3**' to increase the speed until the elevator is running at maximum.



**Figure 34**

## GENERAL DATA

### Nut/bolt tightening torque.

Description.	Torque.	Description.	Torque.
Wheel stud	185 lb/ft	M6 bolt/steel nut	7 lb/ft
Separator roller shaft castel- lated nut	22 lb/ft	M8 bolt/steel nut	19 lb/ft
M6 nyloc zinc plated nut	10 lb/ft	M10 bolt/steel nut	38 lb/ft
M8 nyloc zinc plated nut	23 lb/ft	M12 bolt/steel nut	70 lb/ft
M10 nyloc zinc plated nut	44 lb/ft	M16 bolt/steel nut	170 lb/ft
M12 nyloc zinc plated nut	87 lb/ft	M20 bolt/steel nut	325 lb/ft
M16 nyloc zinc plated nut	208 lb/ft	M24 bolt/steel nut	565 lb/ft
M20 nyloc zinc plated nut	380 lb/ft		
M24 nyloc zinc plated nut	690 lb/ft		

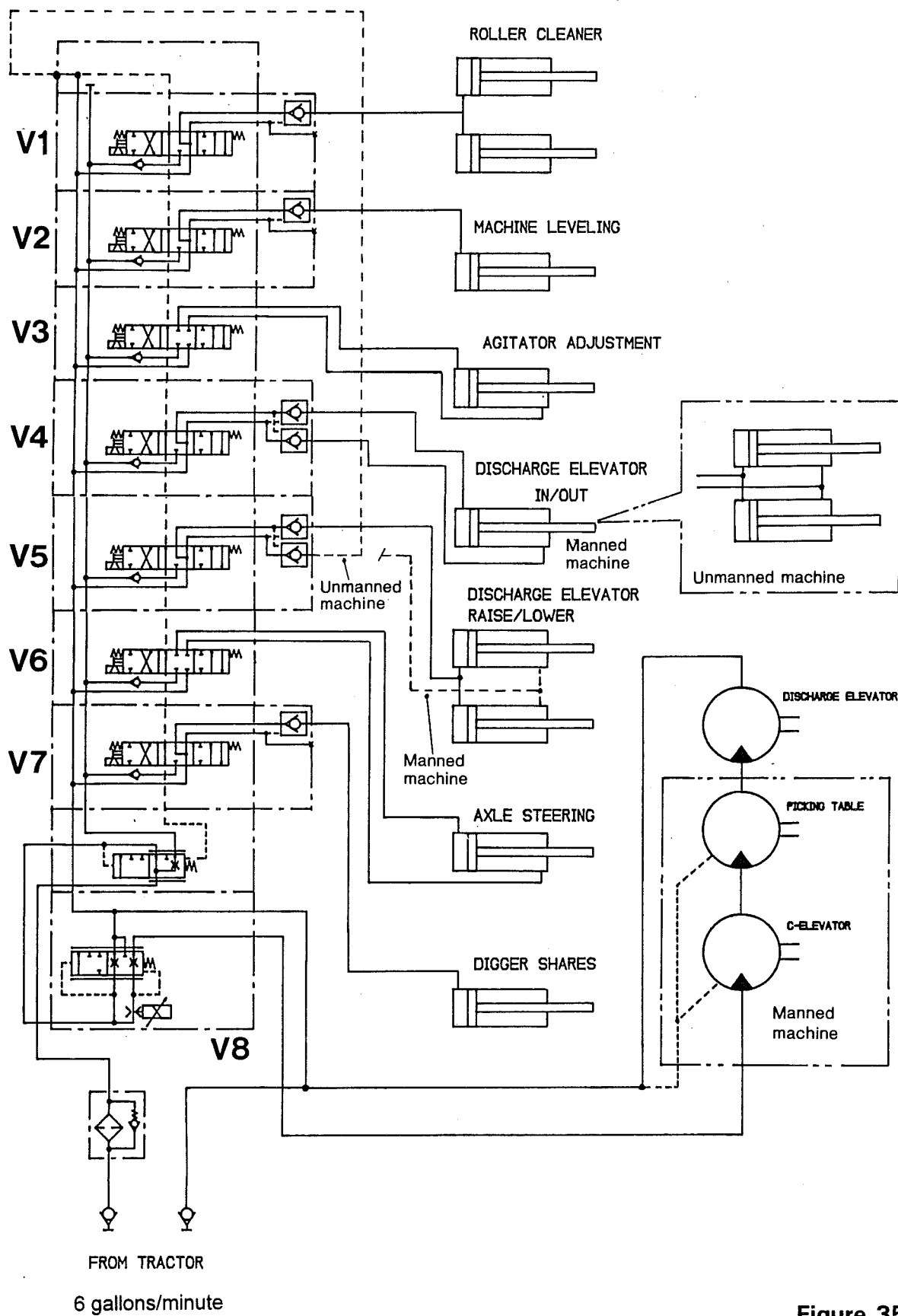
### Statesman Two dimensions and technical data.

	Unmanned.	Manned.
Length in work.	8.3 metres	8.3 metres
Width in transport.	3.1 metres	3.4 metres
Height in transport.	3.1 metres	3.8 metres
Elevator clearance.	3.0 metres	3.8 metres
Weight.	4.7 tonnes	5.7 tonnes
Row widths harvested.	70-90cm	70-90cm
Tractor hp requirement.	75hp, 4 wd	95hp, 4 wd
Required hydraulic flow rate from tractor.	6 gallons/min.	6 gallons/min.
Harvester oil reservoir (Nuto 46 Centistroke Oil)	32 gallons	32 gallons
Tyre pressure.	40 psi.	40 psi.

Standen Engineering's policy of continual improvement means that specifications may be altered without prior notice. All dimensions are approximate.

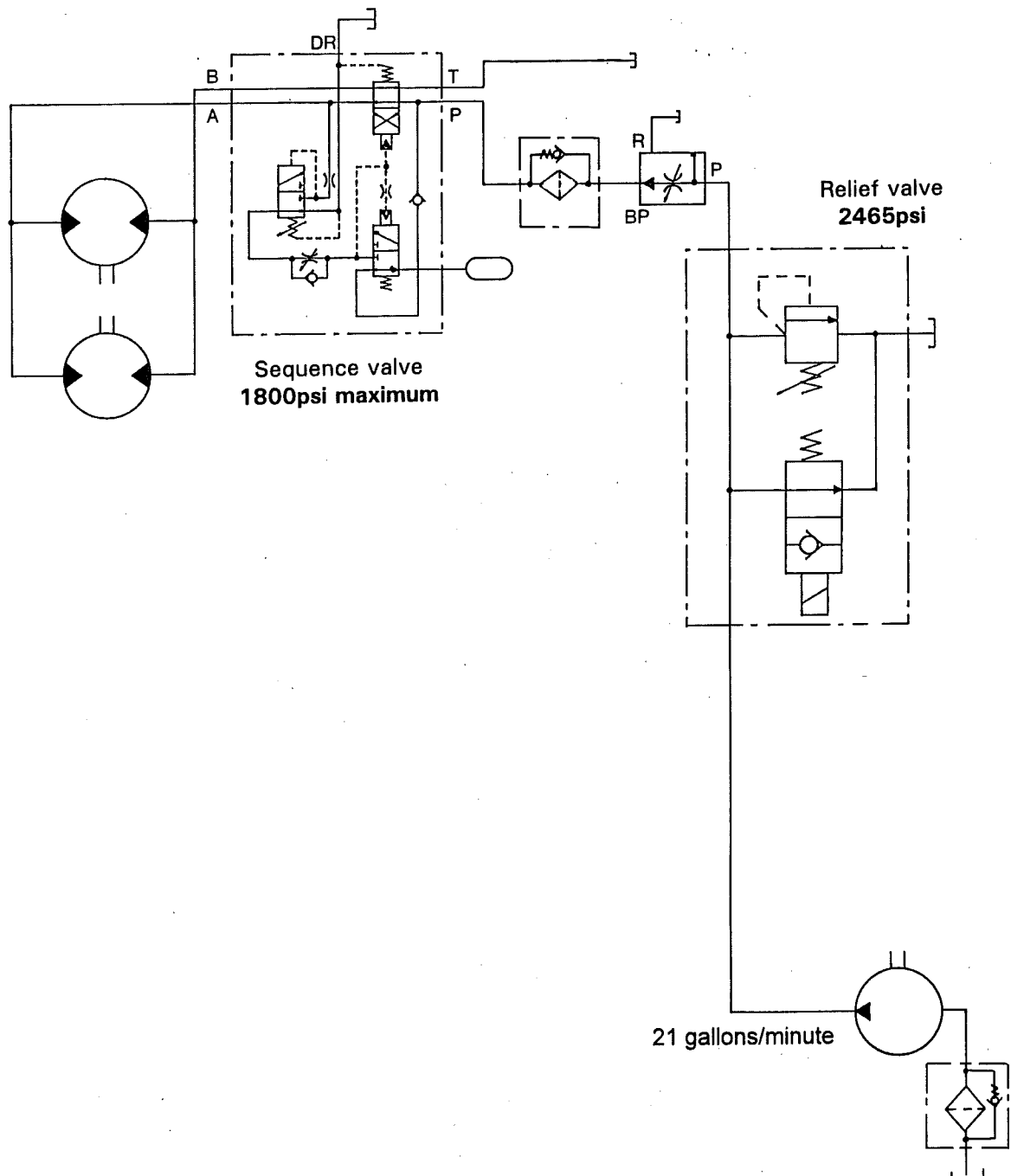
**Tractor hydraulic circuit diagram. (machines from serial no. ST 501)**

**V9** (optional share level or drawbar steer)



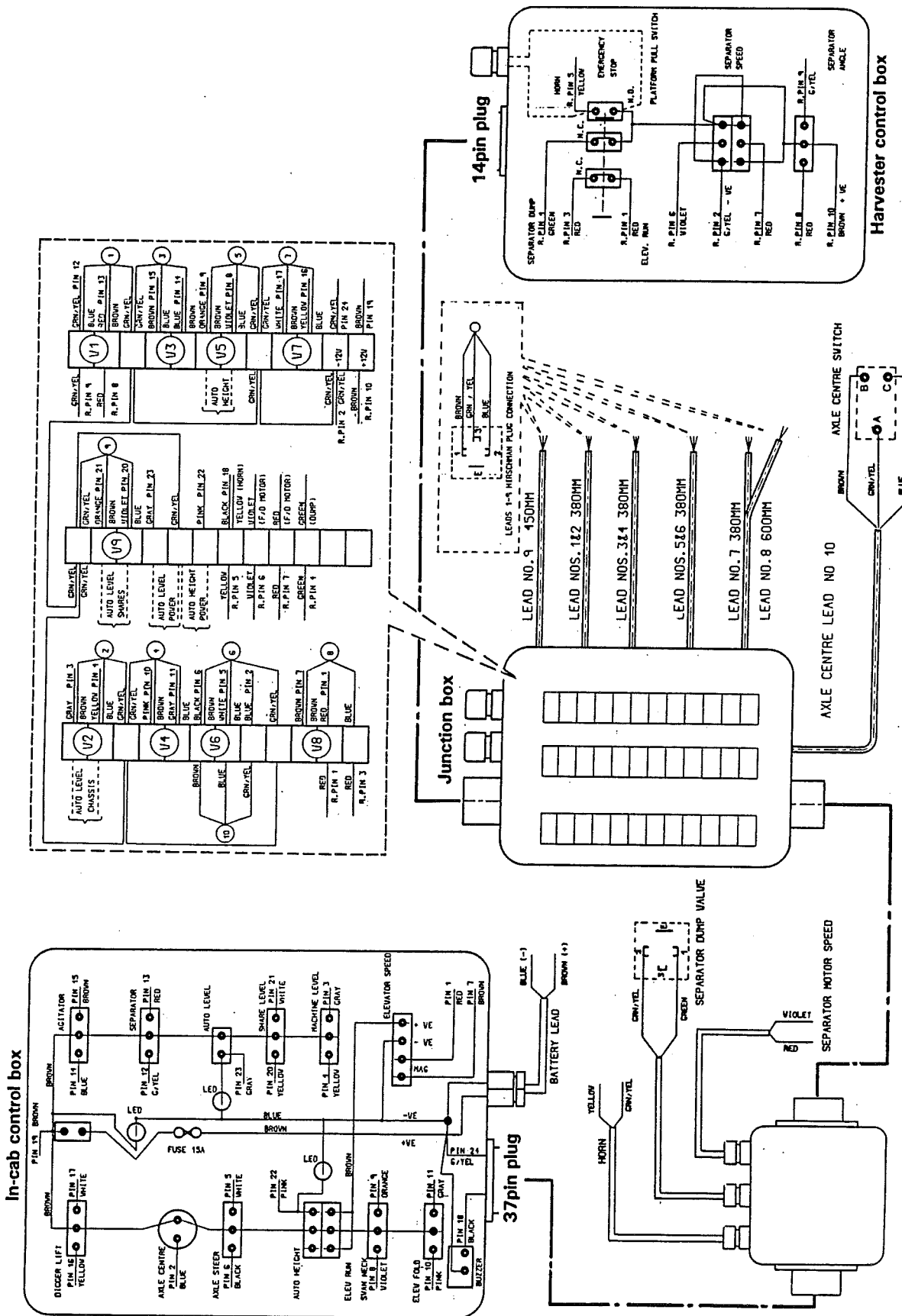
**Figure 35**

**Separator hydraulic circuit diagram. (machines from serial no. ST 501)**



**Figure 36**

**Wiring diagram.** (machines from serial no. ST 501)



**Figure 37**

37pin plug	Colour	Function	Valve number	14pin plug	Colour	Function
Pin 1	Red	Elevator dump coil	8	Pin 1	Red	Elev emerg stop
pin 2	Blue	Axle centre power				
Pin 3	Grey	Axle level lower	2			
Pin 4	Yellow	Axle level raise	2			
Pin 5	White	Axle steer left	6			
Pin 6	Black	Axle steer right	6			
Pin 7	Brown	Elevator dump coil	8			
Pin 8	Violet	Elevator raise	5			
Pin 9	Orange	Elevator lower	5			
Pin 10	Pink	Elevator in	4			
Pin 11	Grey	Elevator out	4			
Pin 12	Grn/Yell	Separator raise	1	Pin 9	Grn/Yell	Separator raise
Pin 13	Red	Separator lower	1	Pin 8	Red	Separator lower
Pin 14	Blue	Agitator increase	3			
Pin 15	Brown	Agitator decrease	3			
Pin 16	Yellow	Digger share raise	7			
Pin 17	White	Digger share lower	7			
Pin 18	Black	Warning buzzer		Pin 5	Yellow	Horn
Pin 19	Brown	Live 12v power		Pin 10	Brown	Live 12v power
Pin 20	Violet	Share level raise	9			
Pin 21	Orange	Share level lower	9			
Pin 22	Pink	Auto elev power				
Pin 23	Grey	Auto level power				
Pin 24	Grn/Yell	Common earth line		Pin 2	Grn/Yell	Common earth line
Pin 25				Pin 3	Red	
Pin 26				Pin 4	Green	Separ emerg dump
Pin 27				Pin 6	Violet	Separ flow divider
Pin 28				Pin 7	Red	Separ flow divider
Pin 29						
Pin 30						
Pin 31						
Pin 32						
Pin 33						
Pin 34						
Pin 35						
Pin 36						
Pin 37						

## **MACHINE CONTROLLED HYDRAULIC DRAWBAR KIT (optional)**

The machine controlled hydraulic drawbar is designed to provide easy manoeuvrability of the harvester to align it with the crop. Control for the drawbar is provided by the existing in-cab control box switch marked '**Share Level, Raise/Lower**'.

To fit the drawbar kit, follow carefully the instructions written below. Pay particular attention to the safety precautions, they are written as a warning to protect you and others.

**WARNING:** Hydraulic pipes and fittings may be under pressure with the machine at rest. Ensure that all residual hydraulic pressure is released before disconnecting any pipework.

### **Fitting Instructions**

- 1, Release residual hydraulic pressure by ensuring that:-
  - a, The discharge elevator is in its fully retracted transport position
  - b, The harvester is lowered fully on the machine levelling ram.
  - c, The separator unit angle is at maximum (lowered fully).
  - d, The digger web is lowered fully (working position), or raised and locked into the transport position using the locking pins.

**WARNING:** When carrying out maintenance to the hydraulic system, cleanliness is of the utmost importance. Avoid any dirt entering the system.

- 2, Disconnect the hydraulic hoses from the tractor.
- 3, Fit the drawbar ram (item 1, figure 38) and ram spacers (item 2, figure 38) between the drawbar and mainframe using the existing pivot bolts.
- 4, Fit the seals (3/8"), adaptors and hydraulic hoses (item 3,4,5&6, Figure 38) to the drawbar ram pressure ports.
- 5, Remove the valve block top bracket securing bolts (item 7, figure 38).
- 6, To maintain the alignment of the valve block sections, change the valve block studs (item 8, figure 38) individually by removing the locking nut and washers (item 9, figure 38) and sliding the stud out from the bottom of the valve block and then replacing it with the new longer stud.
- 7, Carefully remove the valve block end plate (item 10, figure 38).



**8,** Having ensured that the mating surfaces are free from dirt, assemble the new valve section (**item 11, figure 38**) complete with 'o'rings onto the top of the valve block taking care not to damage the 'o'rings.

**9,** Re-assemble the valve block end plate (**item 10, figure 38**) complete with 'o'rings onto the top of the valve block taking care not to damage the 'o'rings.

**10,** Replace the locking nuts and washers (**item 9, figure 38**) and tighten to a torque of 12 Nm (9 lbf-ft).

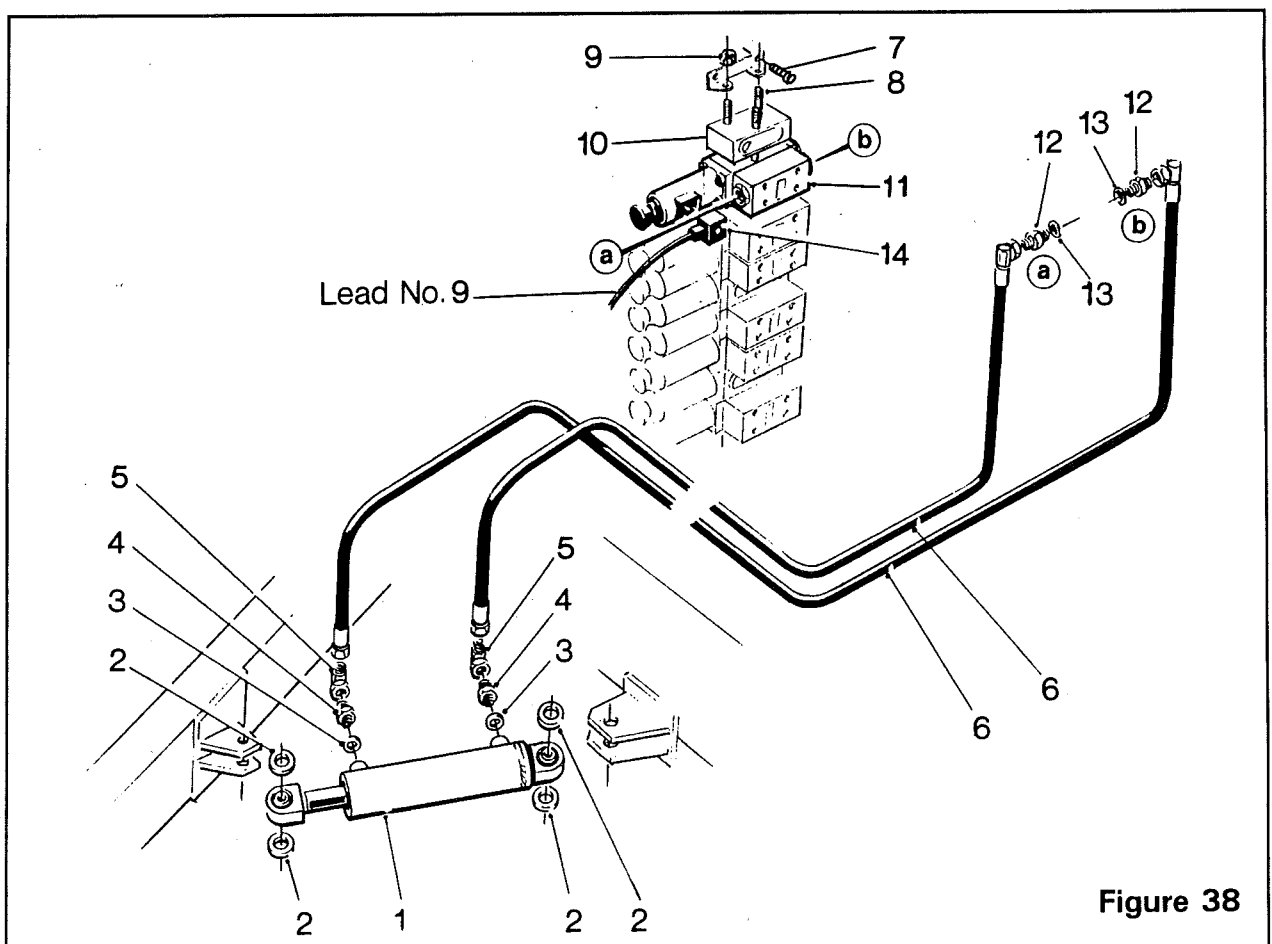
**11,** Resecure the complete valve block by fitting the top bracket securing bolts (**item 7, figure 38**).

**12,** Fit the seals (M18) and adaptors (**item 12&13, figure 38**) into the valve section ports and tighten to a torque of 50 Nm (37 lbf-ft).

**13,** Fit the hydraulic hoses (**item 6, figure 38**) as shown. Secure the hoses by routing them along the existing steel pipes.

**14,** Fit the valve connecting plug (**item 14, figure 38**) to the existing spare junction box lead No.9 (refer to the instruction book wiring diagram) and connect the plug to the new valve section.

**15,** Finally, operate the drawbar ram three or four times (full stroke) to purge all air from the hydraulic system.



**Figure 38**

