

Operating Instructions and Parts Book for

FLAIL TRIMMERS: 420 and 455

Edition No: 7895-06-99

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EC DECLARATION OF CONFORMITY

Conforming to EEC Directive 89/392/EEC

We,

TWOSE OF TIVERTON LIMITED,
6 Chinon Court, Lower Moor Way,
Tiverton Business Park, Tiverton, Devon, EX16 6SS.

Declare under our sole responsibility that:

The product (type) **Tractor Mounted Hedgecutter/Trimmer**

.....

Product Code **T315, T393, T400, T420, T455, T460, T520, T540, T580, T585, T600**

Serial No. & Date Type

Manufactured by the above company/*

.....

(insert business name and full address if not stated above)*

Complies with the required provisions of the Directive 89/392/EEC, and AMD 91/368/EEC,
AMD 93/44/EEC, AMD 93/63/EEC and conforms with European Norm. BS EN 292.

Part 1: 1991 – Safety of Machinery – Terminology, methodology.

Part 2: 1991 – Safety of Machinery – Technical Specifications.

and other national standards associated with its design and construction as listed in the
Technical File.

Signed 
on behalf of TWOSE of TIVERTON LIMITED *Responsible Person*

..... **Chief Design Engineer** **June 2003**
Status *Date*

EC DECLARATION OF CONFORMITY

Conforming to EEC Directive 89/392/EEC

We,

TWOSE OF TIVERTON LIMITED,
6 Chinon Court, Lower Moor Way,
Tiverton Business Park, Tiverton, Devon, EX16 6SS.

Declare under our sole responsibility that:

The product (type) Hydraulic Arm Mounted Flailhead

.....

Product Code TWHD

Serial No. & Date Type

Manufactured by the above company/*

.....

(insert business name and full address if not stated above)*

Complies with the required provisions of the Directive 89/392/EEC, and AMD 91/368/EEC,
AMD 93/44/EEC, AMD 93/63/EEC and conforms with European Norm. BS EN 292.

Part 1: 1991 – Safety of Machinery – Terminology, methodology.

Part 2: 1991 – Safety of Machinery – Technical Specifications.

and other national standards associated with its design and construction as listed in the
Technical File.

Signed John Frank
on behalf of TWOSE of TIVERTON LIMITED Responsible Person

..... Chief Design Engineer June 2003
Status Date

**THIS MANUAL IS TO BE HANDED TO THE CUSTOMER BEFORE
THE MACHINE IS TO BE USED FOR THE FIRST TIME.**

**THIS MANUAL (OR A COPY OF) MUST BE USED AND READ BY
ALL OPERATORS OF THIS MACHINE.**

TWOSE OF TIVERTON LIMITED

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All dimensions and capacities mentioned in this book are approximate. In pursuance of the company's policy of constant development, the right is reserved to depart, without notice, from any detail illustrated or specified in this book, without incurring the obligation to provide such modifications on the machine previously delivered.

No responsibility will be accepted by Twose of Tiverton Limited for any injury, damage or loss arising from the improper use of or lack of maintenance of any machinery supplied by them or from any failure of the user to comply with all instructions published by Tractor or Loader Manufacturers, particularly with the regard to maximum load capacities, tyre pressures and stability, or with instructions and regulations pertaining to Tractor Cabs.

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GENERAL.

SPECIFICATIONS

420 Machines.

Overall Height (machine folded for transport)	3.1 m
Overall Width (machine folded for transport taken from tractor's centre line)	1.3 m
Overall Length of machine (inc. Head)	1.4 m
Total Weight of machine (inc. Oil)	1.1 T

455 Machines.

Overall Height (machine folded for transport)	3.3 m
Overall Width (machine folded for transport taken from tractor's centre line)	1.3 m
Overall Length of machine (including head)	1.4 m
Total Weight of machine (inc. Oil)	1.2 T

Note - Dimensions are approximate and will vary from tractor to tractor.

AIRBORNE NOISE EMISSIONS

The equivalent continuous A-weighted sound pressure level at the workstation (tractor seat) does not exceed 74dB(A). This value was recorded cutting hedges using a Dawe 1405C Sound Meter (BS 3489) on a Massey Ferguson 3090 Tractor complete with M/F Safety Cab.

GENERAL INFORMATION

NOTE:- The provision of this information is a requirement of the Health and Safety at Work Act 1974.

NOTE:- This handbook has been written to help the operator and service engineer/mechanic to use and understand the machine fully, safely and efficiently. It is written bearing in mind the Health and Safety requirements and the new CE requirements which came into force from January 1st 1995.

NOTE:- The handbook/manual is supplied in a waterproof plastic outer cover to prevent damage from rain, condensation, etc. The cover of the handbook includes its own part number, which includes information as to the type of machine and issue date of the manual in question.

NOTE:- DANGER - It is very important that the handbook/manual is read thoroughly throughout, and is completely understood before attempting to attach, use or maintain the machine in any way.

Further copies of this handbook/manual can be obtained from:

Twose of Tiverton Ltd.
Blundells Road
Tiverton
Devon
EX16 4JT
Tel: (01884) 253691
Fax: (01884) 255189

SAFETY NOTES AND WARNINGS

Throughout the handbook the following sub headings are used to draw attention to various points of importance:



**DANGER
WARNING**

This is used to draw attention to very important instructions which **MUST** be followed precisely to avoid injury or death.

CAUTION

This is used to draw attention to instructions which **MUST** be followed to avoid damage to operator, machine, process or the environment.

NOTE

This is used to highlight points used for supplementary information.

ABOUT THE MACHINE

This machine is a Hedgetrimmer of the type known throughout the agricultural industry as a “Flail Hedgetrimmer”.

The machine is intended to be attached to an agricultural vehicle by means of the three-point-linkage couple-up system. The linkage is in turn is locked into position (to prevent movement between tractor and Hedgetrimmer) by means of a pair of adjustable tie arms - forming an ‘A’ frame to ensure a rigid attachment/lock system.

The purpose for its production and its sole intention is to cut/trim hedges, banks, verges, etc.

AT NO TIME must this machine be used for anything other than, or to do any job other than, that for which it has been designed (see above) - In particular:

NEVER USE JIB ARMS AS A CRANE

HEALTH AND SAFETY POINTS.



DANGER
WARNING

Never attempt to assemble, couple up, or operate machinery until you understand fully the functions, controls and safety precautions required, as shown in the operators manual.



DANGER
WARNING

Always follow tractor safety operations and instructions VERY carefully.



DANGER
WARNING

NEVER TAKE RISKS



DANGER
WARNING

NEVER LEAVE TRACTOR SEAT WHILST
ENGINE - OR MACHINE IS RUNNING



DANGER
WARNING

NEVER USE HEDGETRIMMER BOOM
ARMS AS A CRANE IN ANY FORM.



DANGER
WARNING

It may be necessary to stabilise the whole unit once coupled up - by ballasting tractor's rear wheels and/or fitting counterbalance weights to tractor.

Tractor rear wheel track setting could also be widened as a further method of increasing stability. (Check with agent).

- CAUTION -** Be aware of all warning and instruction stickers on the machine as care must be taken and instructions obeyed.
- CAUTION -** Contact your dealer should you need advice, assistance, or if you do not understand any part of the manual or machine.
NEVER ASSUME - if you are not sure - ASK.
- CAUTION -** A machine **MUST NOT** be altered or modified in any way without permission.
 No liability will be accepted in respect of a machine which has been modified without the manufacturers permission.



**DANGER
WARNING**

Never attempt to service/work on/adjust in any way any machinery that is in an unsupported or poorly supported state.

Most machines will need additional support in order that the worker's safety is not reliant only on hydraulic or other services of the machine or tractor.

For example: Any three point linkage mounted machinery
 Front Loaders
 Digger Booms
 Hedgetrimmer booms
 etc.

Always ensure that machinery is safely supported and propped in position.



**DANGER
WARNING**

Always ensure that the wheels of any wheeled implement or machine are chocked firmly and that the implement will not move, before attempting to service or work on the implement/machine in any way or form.



**DANGER
WARNING**

Always **SWITCH OFF** tractor engine before attempting to carry out adjustment, service repairs or inspections on machinery.



**DANGER
WARNING**

Always be aware of your surroundings, and operate machinery accordingly. Beware of confined or tight areas and restricted height due to buildings, overhangs, etc. Drive and operate machines with weather conditions in mind; such as sun, rain, ice, snow, wind, etc. **Make allowances for all situations.**

CAUTION -

Never operate machine in a reckless or uncaring manner. Respect other road users and be patient.

HIGHWAY USE

When operating machinery on the Highways the operator should consult the local Highways Department regarding notification and approval, as rules and regulations will vary from local authority area to area. The Highways Department regulations must be followed.

NOTE:-

In general it is expected that the tractor/implement will follow (go with) the flow of traffic - but this should be confirmed by consulting the local Highway Authority rules.

Always use 'STOP/GO' boards or whatever system the local Highways Department advise and ensure that these are positioned correctly in relation to the machine's operating area.

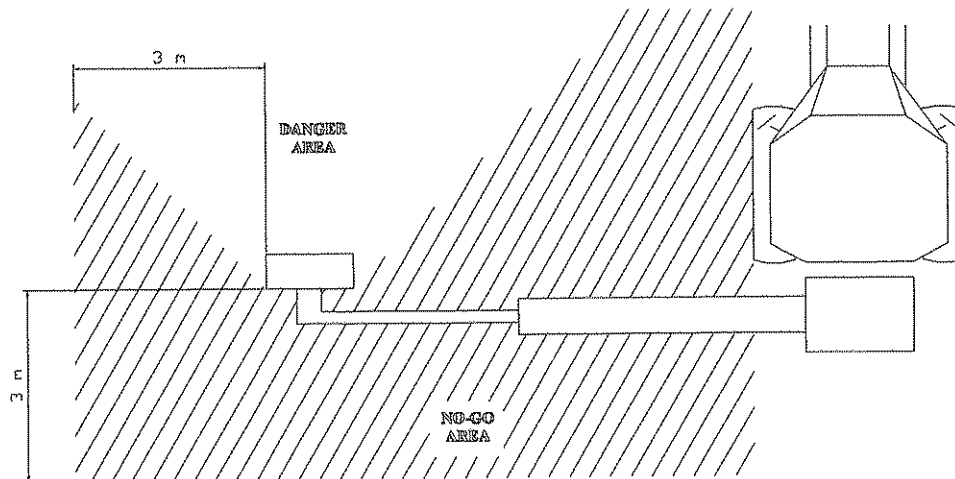
Have respect for passing traffic and keep any passing lane free from obstruction. Allow time for walkers and cyclists to clear the site. Consult the Lighting Regulations for correct procedures when using or travelling on the highway.

CAUTION

Never carry passengers on machinery or on tractors. Ensure bystanders/onlookers are kept well away from the operational area of the machine.

NOTE:- NEVER ALLOW ONLOOKERS/BYSTANDERS TO STAND IN FRONT OF CUTTER HEAD OR IN LINE WITH FLYING DEBRIS.

A sideways and rearward NO-GO area should be kept:



CAUTION - Never operate cutting rotor with blades looking towards operator or towards others. Cutters must always be operated towards hedge or bank/verge etc.

CAUTION - Never walk underneath the machine for any reason, especially if unit is still operating.

PARKING MACHINE.

When machine is being removed from tractor linkage and being 'parked up' it is essential that a good firm base and level site be found.

CAUTION Always chock and prop machine to ensure a good firm position for parking. Ensure that stand legs of machine are correctly locked into position.

CAUTION Never allow children to play on, or around, parked machinery.

CAUTION

Never wear loose fitting or ragged clothing which could get caught in machinery or controls.



**DANGER
WARNING**

Always ensure safety screens are fitted into position to protect operator from flying debris.

CAUTION

Ensure visibility through cab-screens is clear at all times.

CAUTION

Ensure workstation controls, joysticks, cable levers etc are positioned correctly to suit operator, and not obstructing other driving functions.
Controls **MUST** not obstruct entry and exit to cab.

Worn-out and spent waste oil, grease and other noxious substances must always be disposed of in suitable and legally approved dumping containers suitable for the waste in question.

CAUTION

Always dispose of discarded or worn out parts thoughtfully - by disposing of them in an approved and specified legal scrap site, bin or skip.

If the booms and head are not placed onto the buffers provided during transportation from job to job and especially between bouts, whip can be caused in the booms due to uneven surfaces, etc. Such whip will stress the machine much more than typical work. The rubber buffers fitted to the machines are there to eliminate this whip, but **RELY** on the operator making the effort to use them.

CAUTION

Ensure booms are folded onto the rubber buffers fitted and that the whole machine is folded in as close to the tractor as possible for transportation.

SAFETY OF CONTROL LEVERS/JOYSTICK CONTROLLERS

The control levers which operate the hydraulic boom cylinders on all machines will automatically centralise themselves in the centre-off position when the control lever is released. This reduces the chance of unwanted movement or overrun of booms.

GENERAL INSTRUCTIONS

1. Before attaching any machine to a tractor or loader make sure that implement is still standing firmly on a good solid level site. (This will depend of course on how well the site was chosen previously).

Check that any wheels are chocked correctly and that supports/props are in position where necessary to prevent booms, etc. from dropping.

2. Before and during the maneuvering of the tractor or vehicle to attach machinery/implements, make sure that NO other persons are in the vicinity.

Keep other persons well clear and make known your intentions, all the while keeping a sharp lookout whilst reversing and aligning machines for coupling up.

3. Always ensure that brakes are applied correctly to secure the tractor into the selected position. This will prevent the vehicle from moving off on its own to cause injury and damage.

4. Make sure that the lift arms and top link ball ends of the tractor are properly fitted to the machine/implement by using the correct adaptor sleeves where necessary. Retaining pins of the correct type should be used on all three point linkage points. Secure pins with relevant pin and ring assembly.

5. If the machine is of the drawbar type - check that the hitch on the tractor is in good condition and that the hitch pin used is of the correct size and type, and is properly secured when fitted.

6. Should it become necessary to make any adjustments or service the machine while raised on the tractor linkage, or raised on a front end loader, trestles or suitable supports MUST be positioned to support machine to prevent accidental dropping of lift arms, loader arms or mechanical failure.

MACHINES MUST ALWAYS BE PROPPED AND CHOCKED

7. Never attempt to work on, adjust or service/repair machinery of any kind whilst it is still running or working. Always stop the machine and **STOP THE TRACTOR ENGINE** before any adjustments/service/repairs begin.

SWITCH OFF TRACTOR ENGINE BEFORE LEAVING TRACTOR SEAT

8. In transit always use transport stays or locking devices where provided.

If, as in the case of some longer machines, the unit is transported lengthways, make sure that the front of the tractor is suitably ballasted to maintain stability.

A method of achieving this is to add suitable weights to a correctly specified and fitted front weight frame.

9. Always use machines in a sensible and reasonable manner and do not attempt to use them for work for which they are not intended. Avoid overloading and abusing them as this can cause damage to machine and tractor and can be very dangerous.

10. When unhitching/detaching a machine from a three point linkage or from a front end loader ensure that any stands or legs are securely positioned. The machine must be parked where it will not be a safety hazard or cause annoyance to others.

Make sure that chosen parking site is firm and level.

11. Carry out regular periodic maintenance, always with safety in mind.

12. Ensure regular maintenance procedures are maintained for the lifetime of the machine.

13. HEALTH AND SAFETY RULES AND REGULATIONS MUST BE ADHERED TO IN ALL AGRICULTURAL RESPECTS.

INTRODUCTION.

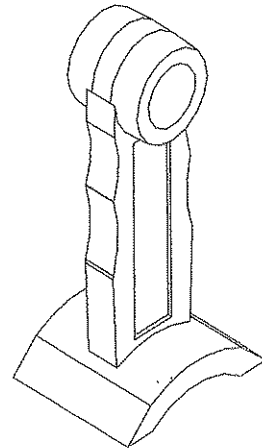
1. The construction is of welded steel fabricated assemblies with various options available covering such things as controls, hydraulics, heads, booms, etc. The cutting head is of a double skin construction.

2. The cutting flail blades offered are:-

(a) Heavy, double-edged design, one piece.

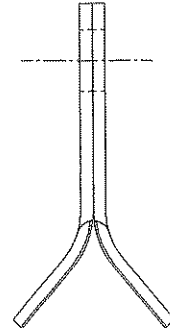
- For UP or DOWN cutting

- Suitable for all types of conditions and growth.



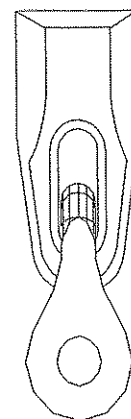
(b) Back to back rigid, one piece blade, in pairs.

- For UP or DOWN cutting, grass mowing and trimming.



(c) Back to back on shackle, in pairs.

- For UP or DOWN cutting of grass and mowing.



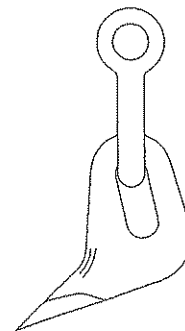
(d) Heavy single edge blade flail (twisted pattern).

- For grass cutting and hedge trimming



(e) Boot Flail (on shackle).

- For grass cutting and hedge trimming



3. The cutter head design is of a double skin construction for greater strength and longer life. The drive is by vee belts from the hydraulic motor to the rotor.

4. Twin vee belts take the drive from motor to rotor, giving the reliability and shock protection that a belt drive system provides.

5. A hydraulically powered breakback system is built into all models. This protects components when encountering obstructions, but can also act as an aid when cutting in difficult and awkward corners.

6. Two parking stand legs are fitted to machine. One acts also as a rear guard and lighting board mounting when in work. The other is a simple stand leg that is inverted when the machine is in use.

7. All machines have a relief valve on the main lift ram which prevents the head unit from being powered into the ground causing undue stresses. This protects the whole machine and is most useful when cutting verges, banks, etc. (Relief is on the drop side of the cylinder only).

8. Hydraulic hoses on the machines have been made as unobtrusive as possible to minimise the risk of their snagging.

9. The control valve slice for angling the cutting head has a detent facility for head flotation which is of value when cutting verges, banks, etc.

10. The 'nose' or front guard of the flail head incorporates a welded-in strip which is there to reduce the risk of wire being dragged onto the rotor at high speed. This is not, however, as good a safeguard as ensuring that the machine doesn't come into contact with wire in the first place.

OPERATIONS.

TRACTOR SELECTION FOR 420 AND 455 FLAIL HEDGETRIMMERS.

For 420: - Tractor size must be a minimum of 35kW (45 HP)

For 455: - Tractor size must be a minimum of 40kW (55 HP)

The tractor must be equipped with a power take off shaft which must be run at 450 rpm during operation.

The PTO shaft should run clockwise when looking at the rear of tractor and should be 1 3/8" S.A.E. - 6 spline type enabling the standard PTO shaft supplied to be fitted.

It may be necessary to fit counterbalance weights (on approved mountings) or to ballast the tractor's rear wheels. **It is vital to ensure that the unit is stable.**

A wider track setting can be advantageous in curing stability problems: contact your agent for advice.

Four wheel drive tractors, with their extra weight, larger front wheels and better grip tend to be more stable when operating these machines.

ATTACHING MACHINE TO TRACTOR.

IMPORTANT:- Ensure machine is parked on a firm and level site without any bystanders or onlookers.

READ AND UNDERSTAND the general and Health and Safety instructions given in this manual.

1(a). FOR PIN TYPE LOWER LINKAGE EYES ONLY

Remove spring pins, lift pins and spacers supplied with Hedgetrimmer from lower link positions of linkage frame.

Slowly and very carefully reverse the tractor towards the machine linkage frame.

With care, ensure that tractor lower link ball eyes fit between the lower jaws of the linkage frame and that the pin holes are aligned.

SWITCH OFF TRACTOR ENGINE AND ENSURE HANDBRAKE IS ON.

With holes of tractor lower link eyes in line with lower jaw holes of frame, the lower linkage pins should now be refitted, with spacers in position on the pins, in between the jaws and outboard of the lift arms. Spacers are provided to prevent sideways movement of link arms.

Secure lift pin into position using the 7/16" diameter pin and ring assembly.

1(b). FOR AUTOMATIC QUICK CROOK-ON ONLY LOWER LINKS

Remove spring pins, lift pins and spacers supplied with Hedgetrimmer from lower link positions of linkage frame. Then reassemble lift pin and spacer together with tractor lower link ball end onto lift pin and between ears of frame: with spacers to the outside. Then secure into position using 7/16" diameter pin and ring also supplied.

Next, slowly and very carefully reverse the tractor towards the machine's linkage frame. Carefully ensure that tractor lower links fit between the lower jaws of the linkage frame and are aligned with the relevant ball eyes (now already on lower lift pins).

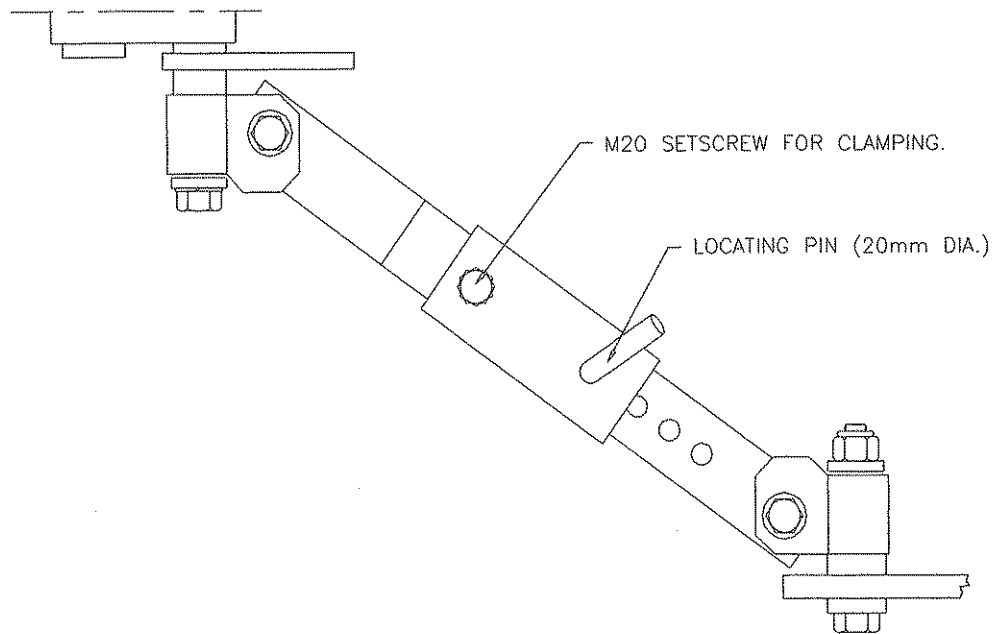
Raise tractor lower link arms to a position that allows the ball to engage correctly into the housing in the lift arm.

2. The main 20mm diameter locating pin which goes through both stabiliser arm assemblies should be removed after first removing its 7/16" diameter lock-pin and ring.

Next slacken off the M20 setscrews which clamp both halves together.

The pair of stabiliser arms can now be telescoped upwards and forwards to allow the top link coupler to be fitted to the tractor top link position. Secure the upper end of the stabiliser to the tractor's top link point using tractor top link pin and spring pin/linch pin and ring.

The top link stay, between Hedgetrimmer and stabiliser frame, may have to be lengthened/adjusted to suit.



3. Start up tractor. Raise the whole machine on the linkage until a height is reached which is a compromise between a horizontal path for the PTO shaft and 300mm (12") of ground clearance for the main frame.

With machine at this height the 20mm diameter locating pins for the stabiliser arms should be fitted through the nearest pair of matching holes and secured with 7/16" pins and rings. Ensure that the chosen setting is the same on both arms.

Tighten the M20 setscrews on each stabiliser arm to lock them together.

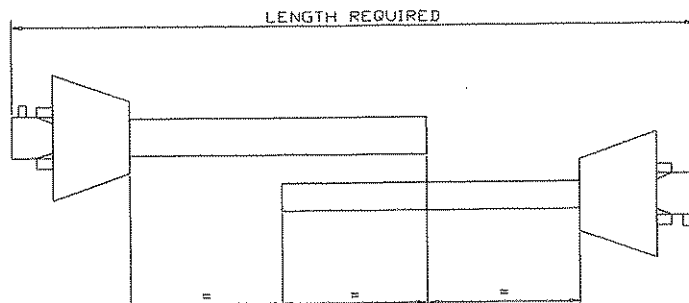
Lower the three point linkage to allow weight of machine to be taken on stabilisers.

Tractor lower linkage check chains assemblies should now be tightened to ensure that tractor arms are locked and machine is positioned centrally at rear of tractor. Loose check chains are the primary cause of machines rocking on the back of the tractor.

Top link should now be adjusted to ensure Hedgetrimmer is level from front to rear.

4. Check the length of the PTO shaft.

When connected from tractor to machine the shaft should engage by $\frac{1}{3}^{\text{rd}}$ of the total shaft length: male part should be halfway from disengaged to fully bottomed out.



Do not use the machine until shafts have been cut to the correct length.

5. Fit the PTO shaft. Ensure the shaft is correctly fitted to matching splines at both ends. Fit the anti-spin chains of the PTO guard to a rigid non-turning assembly.
6. The rear guard is brought to its working position by removing the two upper $1\frac{1}{8}$ " linkage pins, raising the guard manually, until it is horizontal and then replacing the pins and their associated clips.

The front stand leg is held in place by a pin and R clip. On removing these invert the stand leg (turn it upside down) and replace the pin and R clip.

Note that the rear guard is designed to allow the fitting of a lighting board. This allows the operator to make the machine more visible to other road users should he so wish, or should future legislation specify so.

7. The mesh safety screens should now be fitted.



**DANGER
WARNING**

All glass screens on the relevant side of the cab must be protected.

The screens are designed to be fitted to the tractor cab on the cutting head side (i.e. for left-hand cut machines to left-hand side of cab). Bolts, nuts and washers are supplied for fixing purposes.

8. Fix valve control handles into position. Control levers are supplied bolted together as a unit. Cables should not be forced into arcs of less than 150mm (6") in radius otherwise the controls will be stiff to operate and the cables will be damaged. The unit includes a support leg, which will slot into a bracket supplied for fitting to the tractor. Depending on the model there may be 4, 5 or only one controller in the set. The locating bracket should be positioned on the inner wing face of the tractor cab in a suitable position for easy operation. Bolts, nuts and washers are supplied for fixing.

It is suggested that the bracket is fitted to the left-hand wing for left-hand cut machines and right-hand wing for right-hand cut machines.

Once the bracket is fitted to the cab side the controller unit can be lowered into the slot in the bracket and secured by tightening securing screw (clockwise).

9. **IMPORTANT** - Check the oil level within the tank: it should be halfway up the small bullseye sight glass, close to the return filter.

10. The tractor's power take off can now be engaged **CAREFULLY**.

Check that PTO is running correctly and that the guard is not spinning.

Oil will now be pumping within the hydraulic system.

11. Check the movement of the hydraulic valves by operating the control handles. This should be done with great care until the operator gets a good 'feel' for the controls and feels competent. Each control lever top is individually labeled as to which operation it controls.

The valve slice sections are assembled in the following formation:

<i>Forward</i>	<i>Anti-clock</i>	<i>Out</i>	<i>Down</i>
^	^	^	^
<u>Breakback</u>	<u>Head Rot</u>	<u>Boom 2</u>	<u>Boom 1</u>
v	v	v	v
<i>Back</i>	<i>Clockwise</i>	<i>In</i>	<i>Up</i>

The formation could be changed to suit the individual, if so desired. Note that the order in which the valve slices are grouped on the block differs from this.

REMOVE HEDGETRIMMER FROM TRACTOR

1. Select a good clear, level and firm site on which to detach and store machine.
2. **IMPORTANT.** Use the hydraulics to lower the head onto the ground horizontally (as if you were cutting grass) making sure that the breakback ram is fully extended.
3. Disengage the PTO drive and STOP THE TRACTOR ENGINE.
4. Take the stand leg from its stored position and invert it into its down position, securing it with the R clip provided.
5. Similarly, rear guard should be swung down into its rest position and the pins secured with the linch pins provided.
6. Slacken both M20 setscrews on stabiliser arms, remove the 7/16" diameter linch pins from the stabiliser locating pins, and remove pins. It may be necessary to raise three point linkage slightly to free pins for removal. Lower the Hedgetrimmer so that stands are on the floor (with tractor 3 point linkage). Top link may have to be adjusted to ensure trimmer is upright and safe.
Make sure that trimmer is properly settled and safe on the stands.
Disconnect top link assembly from stabiliser end.
Uncouple stabiliser 'A' frame from tractor top link position by removing 7/16" linch pin and tractor top link pin.
7. Remove control handle set from tractor and stow on trimmer. Note, for semi-independent machines, 2 hoses (supply and return) must be uncoupled from tractor auxiliary ports and stowed on the machine.
8. Disconnect PTO shaft and anti-spin chains (tractor end).

9. For pin type lower link arms: Remove lower lift pins from linkage.
For quick hitch crook-on arms: Release crook locking levers and lower arms away.

Tractor linkage arms are now free of trimmer.

10. Draw tractor slowly away. Many operators stop about 300mm (12") away to double-check that tractor and machine have completely parted company and that no connections or couplings have been forgotten for any reason.

Safety screens can now be removed from the cab if so desired.

11. Replace pins through stabiliser arms and secure in position with linch pins.
12. Reconnect top link bar assembly onto stabiliser with pin and linch pin provided.
13. Replace lower linkage pins back into relevant positions on mounting frame and secure with linch pins.
14. Make sure tractor top link pin is replaced and secured with its linch pin.

OPERATING THE HEDGETRIMMER.

INTRODUCTION.

The vehicle driver should be conversant with all tractor controls and capabilities. It is always advisable for the driver to practice the controls and operations of the Hedgetrimmer **before** commencing work.

The speed of cutting when trimming will depend on the size, quantity and type of growth to be cut. A speed slow enough to suit the conditions should be selected, ensuring that engine speed gives a PTO speed of 450 rpm for general use. This 450 rpm is recommended for best trimming results and performance. Variation from this recommended rpm should be kept to a minimum and never at any time should PTO rpm exceed 540 rpm.



**DANGER
WARNING**

Cutting head should be kept as close to tractor as conditions and cutting position permit. This ensures the maximum stability of the unit.

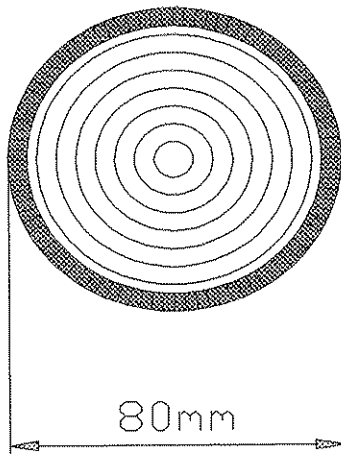


**DANGER
WARNING**

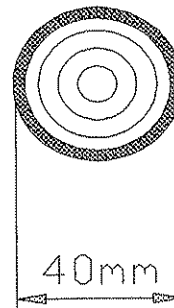
Never operate rotor with cutter flails directly towards operator, i.e., underside of head towards operator.

CUTTING THICKNESS LIMIT.

SOFTWOOD



HARDWOOD



ROTOR ROTATION DIRECTION

A choice of rotation direction is offered on fully-independent machines only.

The 'upward' cut is recommended for trimming grass and one to two years' growth of hedge. The 'downward' cut is **NOT RECOMMENDED** and should only be considered for really heavy cutting of large diameter growth. Even then, it is important that down cutting be limited to a minimum and only for very short periods.

There is a risk of serious damage to the hydraulic system should the rotor direction be reversed without it first coming to rest.



**DANGER
WARNING**

At NO TIME should the rotor be cutting upwards at front with front cowling removed.

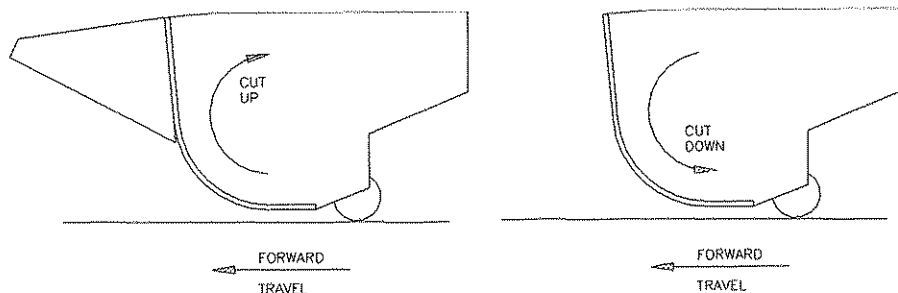


**DANGER
WARNING**

With rotor cutting downwards at the front the roller must not be removed.

On leaving the factory the machine will be set for upward rotor cutting.

NEVER CHANGE DIRECTION OF CUT WHILST ROTOR IS STILL TURNING.



The motor spool control lever has a 'balk lock' control built into it to ensure that the rotor's cut direction cannot be accidentally reversed. The control allows the lever to be moved in one direction only, from centre OFF position to selected rotor cut direction.

The controller/cable sets come from two suppliers and though physically different, their actions are similar. When the lever is rotated to its extent (Morse - red cables) or pin is rotated till horizontal (TMC - grey cables) the control handle can be moved to and from neutral in that direction. On the TMC controller placing the pin vertically stops the lever from being moved at all.

HYDRAULIC CONTROLS - CUTTING POSITION.

The cutting head must at all times be lowered gently into its cut position. Never drop the head into work at speed.

When cutting at ground level (grass, etc.), the head must be lowered gently to give a slight contact pressure of roller to ground.

IMPORTANT: Ensure rotor and roller do not get involved in high obstacle forces such as rocks, stones, stumps, etc. Keep rotor away and free from wire, as to entangle wire in the rotor is very dangerous and very costly.

Should large obstacles be encountered or wire be caught in rotor then you must **STOP IMMEDIATELY**. Reset or clear before starting.

Normal obstacles and level variations should be overcome by operator slowing the forward speed and raising or lowering the head to suit.

CUTTING HEAD.

The rotor of the cutting head has been balanced prior to fitting: this is to ensure a vibration-free cutting unit.

Should the rotor become blocked, hit an obstacle, lose a blade or blades, the rotor may be put into a state of imbalance. This will result in vibration in the rotor that will also be transmitted to other parts of the machine.

Should vibration occur **STOP IMMEDIATELY**, as to continue working could have serious consequences, besides damaging bearings and weakening the structure.

Once stopped clean rotor and check for loss of blades and bolts, replacing as required.

In severe cases, perhaps as a result of hitting solid objects with serious force, rotors can become bent, which will also cause vibrations. In such cases the rotor will have to be re-balanced, repaired and re-balanced or even replaced.

BREAKAWAY.

When the head meets an obstruction the breakaway ram closes steadily due to the action of a relief valve built into the valve block. This allows the outer boom to pivot backwards around its near end. In order to reset the position of the cutting head the control lever for the breakaway will need to be operated.

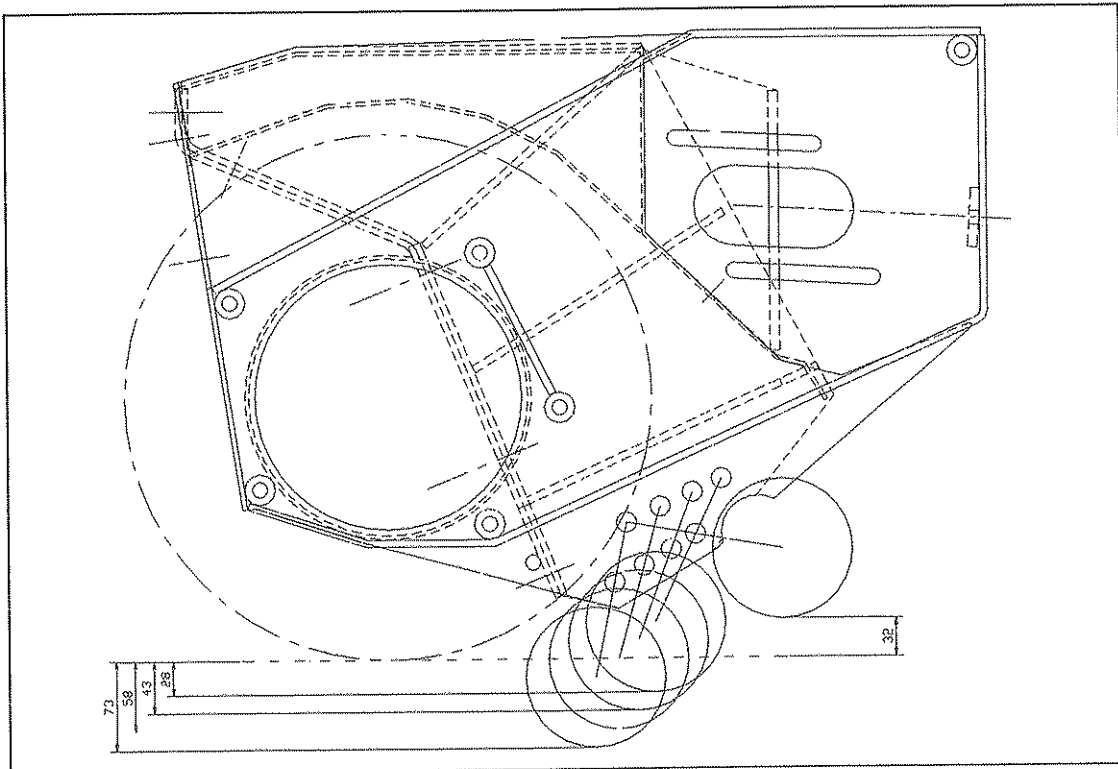
TRANSPORTATION.

- (1) Disengage rotor drive.
- (2) Turn cutting head until head is approximately at right angles to outer boom with flails away from tractor.
- (3) Swing head rearwards by powering breakback ram.
- (4) Fold in second boom, until boom main tube contacts rubber buffer fixed to first boom.
- (5) Operate the main lift ram, breakback ram and head angling ram to position head gently onto rear guard. The head will now be positioned behind and slightly inside of the tractor rear tyre.
- (6) The unit is now ready for transport.

ADJUSTING ROLLER HEIGHT.

The flail head cutting height control roller has various height setting options.

See diagram below;-which shows four height settings for mowing and a 'clearance' position for hedgecutting.



The job of altering the height setting can be made easier by placing the head so that the roller is standing vertically. The lower end of the head must be rested on the ground (or a substantial support, resting on the ground).

ELECTRIC CONTROL MACHINES

These models include all basic specifications as listed for non-electric machines. All models have fingertip joystick controls with solenoid operated valves. One model has a power boom float facility. The main components, such as tank, booms and head remain unchanged. The power supply required to operate the electrical components is taken from the tractor 7 pin rear trailer socket. The side light terminals being the contact points used as power supply, this means that the tractor side lights MUST be ON at all times whilst the flail is in use.

The power float system incorporated allows the head to floor contact pressure to vary. This system will reduce downward force and therefore produce less 'drag' on the head, which in turn protects the booms and pivots by reducing load on these parts.

ATTACHING MACHINE TO TRACTOR.

In addition to previous notes on this section for non-electric machines the following points should be adhered to.

The electric joystick control box is supplied bolted to its mounting stand. The control box locating bracket should be positioned on the inner wing of the tractor at a suitable position to suit lever operation. Secure support bracket to wing in chosen position with bolts provided.

For left hand cut machines - fit support bracket to inner face of nearside wing.

For right hand cut machines - fit support bracket to inner face of offside wing.

With support bracket secured into position the control box mounting leg will fit into the slot of the locating bracket and can be secured by tightening the screw.

JOYSTICK LEVER OPERATION.

Test the hydraulic control systems of the machine by operating the joystick control levers. Operate the controls with great care to ensure smooth and gentle movements of booms and rams, etc. The controls should be tested until operator has a good feel for all the operational movements.

HEAD FLOAT (BLUE LAMP)

This allows the head (only) to float about its centre pivot axis.

Switch head float ON (blue lamp will show)

NOTE:- After prolonged use of float on banks/verges a slight delay may occur when joystick switch for head rotation is energised, this is due to the cylinder recharging with oil.

IMPORTANT:- Float switch must be OFF if float not required.

FUSE

The electrical system is protected by a 5 amp fuse (1" x 1/4") BS1362.

MAIN FLOAT (RED LAMP) - FULL FLOAT MACHINE ONLY.

This function is only required when bank/verge cutting.

1. Ensure head is resting on the floor.
2. Switch float ON (red lamp will show)
3. Adjust float pressure by turning potentiometer knob either clockwise for lighter/raise, or anticlockwise for heavier/down pressure.

IMPORTANT:- Ensure setting of float gives a slight downward force to prevent machine rising from work. This can be achieved by turning clockwise to find where machine rises and then turning anticlockwise to lower machine back to floor, adding approx. 1/2 turn to settle.

Float can be overridden by moving joystick to the raise position. On returning joystick back to its neutral position the float will automatically come back into operation.

NOTE: If head is raised from ground (with float switch ON) and joystick is returned to neutral position, the head will gradually return to the floor, at this time normal float conditions will resume.

IMPORTANT:- Float switch must be in OFF position if float not required.

MAINTENANCE.

GREASE POINTS.

On each pivot of booms, links or rams a grease nipple will be found and its position will be highlighted by a transfer symbolising a grease gun. These should be greased daily.

PTO SHAFT.

The PTO shaft should be examined weekly, both in regard to its mechanical condition and that of its plastic guarding. Any damage to the guarding should be rectified with urgency and the anti-spin chains **must** be used. Universal joints should be greased sparingly at this time. Fortnightly the internal shaft should be greased along its length to ensure that it will continue to allow the unit to telescope.

HYDRAULIC OIL.

The hydraulic system will have been run-up and checked at factory prior to the machine being dispatched.

The hydraulic tank will be filled with EXCELUBE ULTRA 46 hydraulic oil when the machine is delivered. Oil tank capacity is 195 litres (43 Gallons).

NOTE: The filler/breather on the top of the tank is equipped with a strainer to ensure that all oil is strained on entering the tank. For this reason the strainer basket should never be removed and all hydraulic oil filling must be done through the strainer.

It is advisable NEVER to mix hydraulic oils, but if another suppliers' oil is to be used, then one that is known to be compatible must be chosen (check with oil supplier).

A bypass will operate should the return filter become excessively clogged. Though this protects the operator and other personnel it does mean that filtration then ceases. It is important therefore that:

**THE OIL FILTER MUST BE CHANGED AT 50 HOURS INITIALLY AND
EVERY 250 HOURS THEREAFTER.**

The oil level in the tank should be checked daily, using the bullseye sight glass near to the return filter.

Contamination of the oil will necessitate it being changed: this is indicated by a darkening in its colour and/or it smelling 'burnt'.

Keeping the area around the filler cap clean (particularly when removing the cap), changing filters on time and using clean containers will all help to reduce oil contamination.

GEARBOX FOR HYDRAULIC PUMP.

The gearbox powering the hydraulic pump(s) will be pre-filled to the correct volume of 0.5 litres, with S.A.E. EP90 gear oil. This grade must be used when topping up.

Level should be checked every few months using the sight glass on the gearbox and the oil should be replaced every 2 years.

HOSES.

Hoses should be regularly checked to ensure that the metal braiding is undamaged. Should damage have occurred, affected hoses should be replaced as their ability to withstand pressure will be reduced, increasing the risk of their bursting. Care should be exercised when replacing hoses to ensure that each new hose terminates at the same places as the hose it replaces and that its route is as the original.

Hose ends and other hydraulic connections should be checked daily to ensure there are no leaks.

CABLES AND CONTROL HANDLES.

No maintenance of cables or controllers is necessary and cables should **not** be lubricated. Should the controls become difficult to operate the route of the cables should be checked to ensure that there are no kinks or excessively small radii.

FLAIL HEAD.

Keep the cutting blades **VERY SHARP**; this should be inspected daily. Bolts and nuts holding flails to rotor should be checked frequently and kept **tight**. Missing or broken flails should be replaced immediately, as the imbalance will rapidly harm bearings and structure. When a flail is renewed its opposing pair should be renewed also to maintain balance.

Check vee belt tension on cutter head daily: a load of 5 Kgs (10 lbs) should give a deflection of 9mm at these pulley centres. Access to the belts is by removing the guard panel on the side of the drive end. Tension is adjusted by first slackening the bolts mounting the motor (nuts are held from turning on the inside). The nuts on the threaded adjuster can now be turned to give the required tension and then re-tightened and the motor mounting bolts then tightened also.

LAYING-UP

Clean the machine and note any damage or repairs needed. Arrange for spares and repairs as required in preparation for next season.

The machine should be lubricated fully and any exposed bright surfaces greased **particularly** any exposed rods of rams.

Store machine in dry conditions, preferably undercover.

Vee belt tension on cutter head drive should be released to protect the belts.

PARTS LIST

Always order genuine **Twose** spare parts for your machine. They are designed and manufactured to give the best operational results. In some cases parts will be of a higher specification than their usual counterparts and this will not be immediately apparent.

ORDERING SPARE PARTS.

In order for both Twose and your dealer to give the best possible service when ordering spare parts, please specify:

- (a) Machine type and serial no.
- (b) Part no. of component(s)
- (c) Description of component(s)
- (d) Quantity required
- (e) Full address to which spares are to be sent
- (f) Method of delivery required

In the absence of specific instructions consignments will be sent by post or carrier, if it is not possible to deliver by our own transport.

Please double-check that you have ordered the correct parts and a sufficient quantity to complete the job.

Twose have a policy of continuous improvement which means that parts may be modified/replaced in the course of time due to the introduction of new materials, or improved design. The latest parts, if compatible, will be supplied whenever possible.

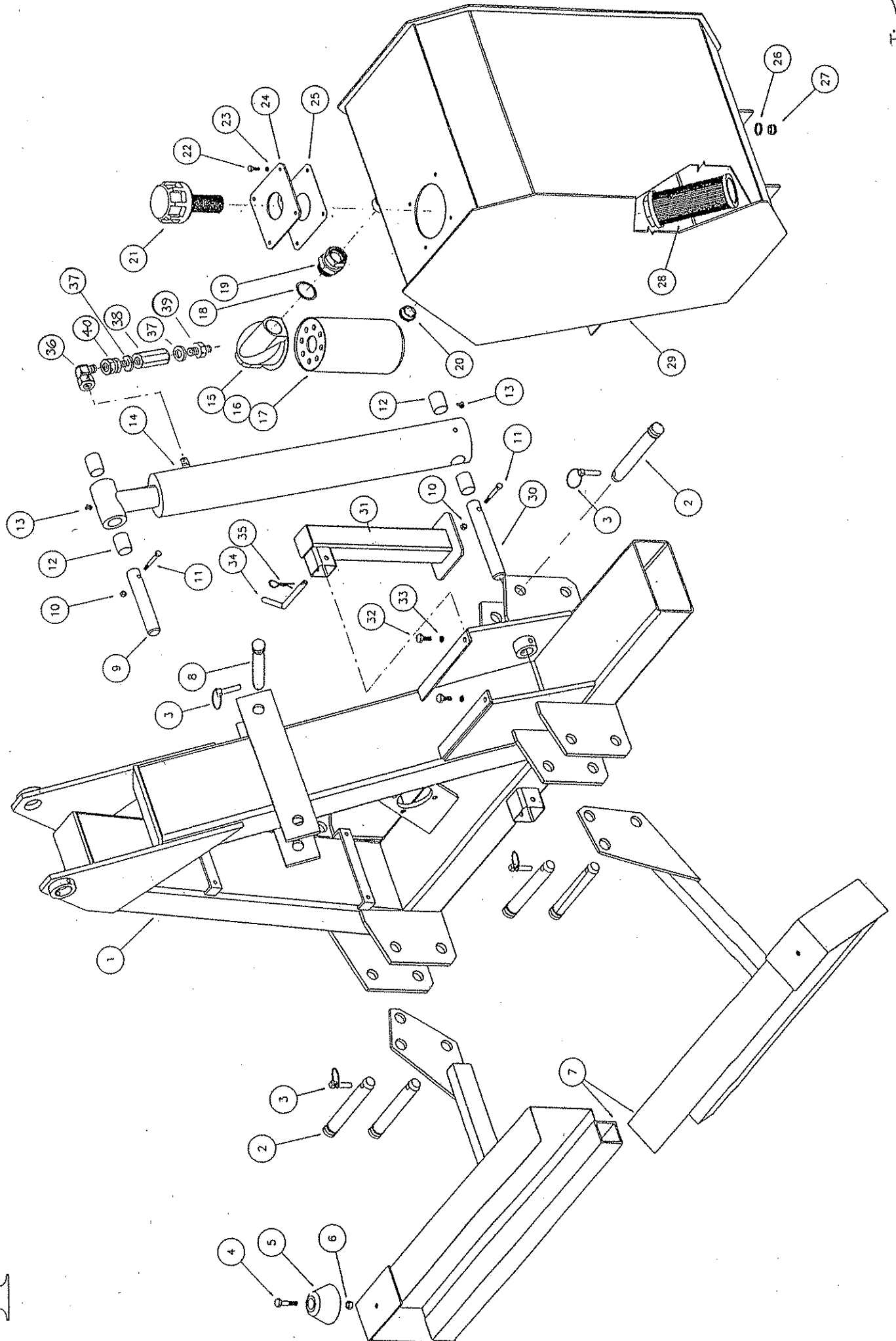
Should it become necessary to return any item for exchange or credit please state the number of our invoice or sales slip and the reason for the return.

WARRANTY AND SPARE PARTS.

Enquiries regarding these machines and orders for spare parts should be addressed to:

Twose of Tiverton Ltd.
Lowman Green
Tiverton
Devon
EX16 4JT

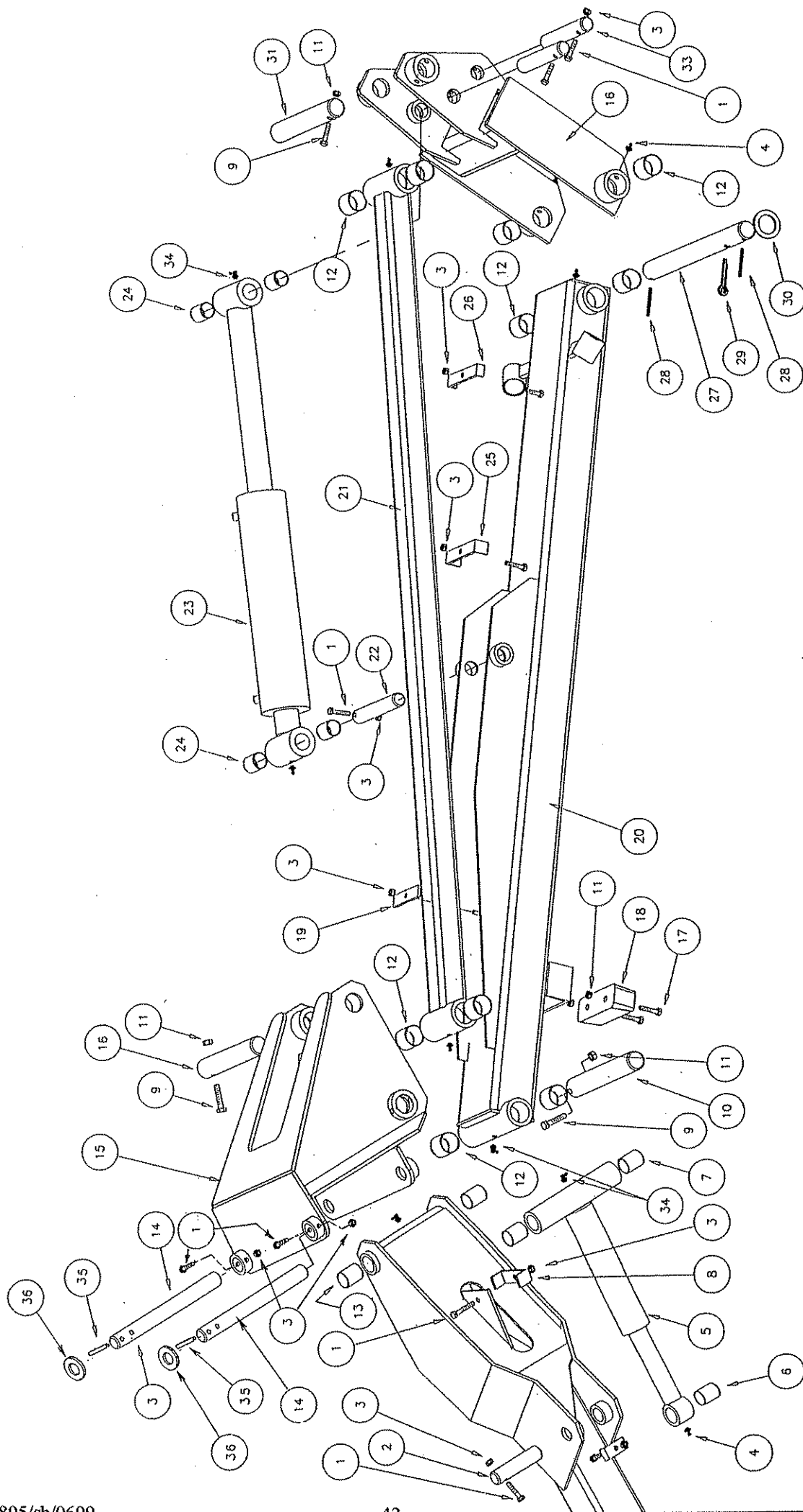
Tel: (01884) 253691
Fax: (01884) 255189



MAIN FRAME PARTS.

1	187.029	Main Frame assy	1
2	7482	Pin Linkage 1.1/8"	6
3	0832	Pin Linch 7/16"	5
4	2935	Bolt M10 * 45 (8.8)	1
5	1492	Buffer Rubber	1
6	4421	Stiffnut M10 Nyloc	1
7	187.051	Head Suppt/Rear Guard	1
8	2584	Pin Linkage 1"	1
9	187.041	Pin, 1st/2nd Rod 30 Dia EN8 x 172 9xd	1
10	3182	Stiffnut M 8 Nyloc	2
11	3262	Bolt M 8 x 60 (8.8)	1
12	1870031.1	Bush for Ram	(4)
13	2944	G/Nipple M10 * 90°	2
14	1870031	Ram 1st	1
15	3345	Body for 3126 Filter	(1)
16	3126	Filter Return 25μ	1 Cable machines use
16	7576	Filter Return 10μ	1 25μ filter return,
17	3346	Element 25μ for 3126 Filter	(1) Electric machines use
17	7576.1	Element 10μ for 7576 Filter	(1) 10μ.
18	3155	Seal 1.1/4" Dowty Bonded	1
19	7896	Adaptor 1.1/4 bsp M-FLN	1
20	6966	Gauge Oil Level 1BSP Bullseye	1
21	6334	Filler/Breather	1
22	2793	Setscrew M 8 x 20 (8.8)	4
23	3001	Washer M 8 Spring	4
24	187.018	Cover Plate 5MS x 150x 150	1
25	1870019	Gasket for Breather	1
26	0909	Seal 1/2" Bonded	1
27	7753	Plug 1/2 BSP Magnetic	1
28	3717	Strainer Suction 1.1/2 BSP	1
29	187.017	Tank WA	1
30	187.044	Pin, 1st Ram Anchor 30 Dia EN8 x 206	1
31	187.030	Stand Leg	1
32	2917	Setscrew M10 * 25 (8.8)	2
33	2728	Washer M10 Spring	2
34	185.069	Pin for Stand 12 Dia BDMS x 180	1
35	6573	R Clip Sparex S12	1
36	6948	Adaptor 1/4" BSPM/FM (91)	1
37	1181	Seal 1/4" BSP	2
38	7813	Restrictor 'one-way' (1.8)	1 For Independent or
or			Semi-Ind m/cs only
38	8091	Restrictor 'one-way' (1.1)	1 For Electric m/cs only
39	1823	Adaptor 1/4" BSP	1

TWOSE



BOOM PARTS.

1	3262	Bolt M 8 * 60 (8.8)	7
2	187.045	Pin, Breakback Ram 30 Dia EN8 x 122 9xd	1
3	3182	Stiffnut M 8 Nyloc	10
4	2923	G/Nipple M10 x 1.5	11
5	1870033	Ram Breakback	1
6-7	For details of component parts of Ram, please refer to the page in this manual which assists in Ram identification.		

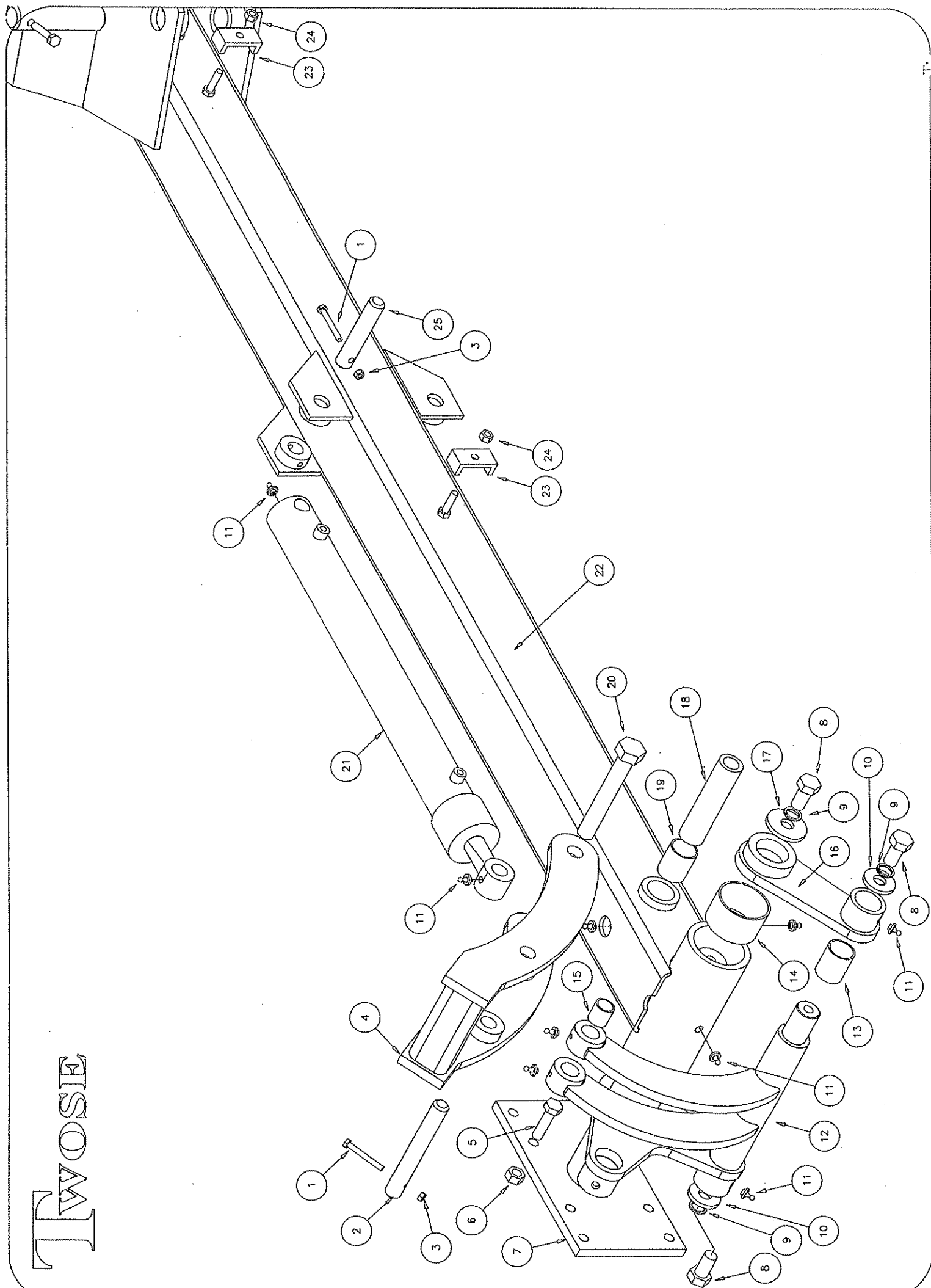
8	187.059	Pipe Clamp Outer Boom 25x6MS x 130	1
9	2994	Bolt M10 * 75 (8.8)	3
10	187.038	Pin, 1st Boom Top 40 Dia EN8 x 256 11xd	1
11	4421	Stiffnut M10 Nyloc	5
12	6257N	Bush 4040M Nylon	10
13	3124	Bush 3040M Nylon	2
14	187.037	Pin, 2nd Boom Anc. 30 Dia EN8 x 289 9xd	2
15	187.025	Centre Boom	1
16	187.039	Pin, Para Arm Top 40 Dia EN8 x 224 11xd	1
17	2935	Bolt M10 * 45 (8.8)	2
18	7879	Rubber Buffer 6"x2"x2"	1
19	187.048	Pipe Clamp - Main Boom 25x6MS x 100	1

Depending on model:

20	187.021B	First Boom - 420	1
20	187.021A	First Boom - 455	1
21	187.020B	Parallel Arm - 420	1
21	187.020A	Parallel Arm - 455	1

22	187.041	Pin, 2nd Ram Anc. 30 Dia EN8 x 172 2~9xd	1
23	1870032	Ram 2nd	1
24	For details of component parts of Ram, please refer to the page in this manual which assists in Ram identification.		

25	187.049	Pipe Clamp - Main Boom 25x6MS x 155	1
26	187.046	Pipe Clamp - Main Boom 25x6MS x 129	1
27	187.043	Pin, Main Pivot 40 Dia EN8 x 400 6/11xd	1
28	5188	Spring Pin M 6 * 60	2
29	7911	Split Pin M10 x 80 MS	1
30	187.058	Washer 40id 60 Dia BDMS x 5	2
31	187.042	Pin, Para Arm Base 40 Dia EN8 x 242 11xd	1
32	187.023	Rocker	1
33	187.041	Pin, 1st/2nd Rod 30 Dia EN8 x 172 9xd	2
34	2944	G/Nipple M10 * 90°	4
35	6960	Spring Pin M8 x 55	2
36	2725	Washer M30 (Form A)	2

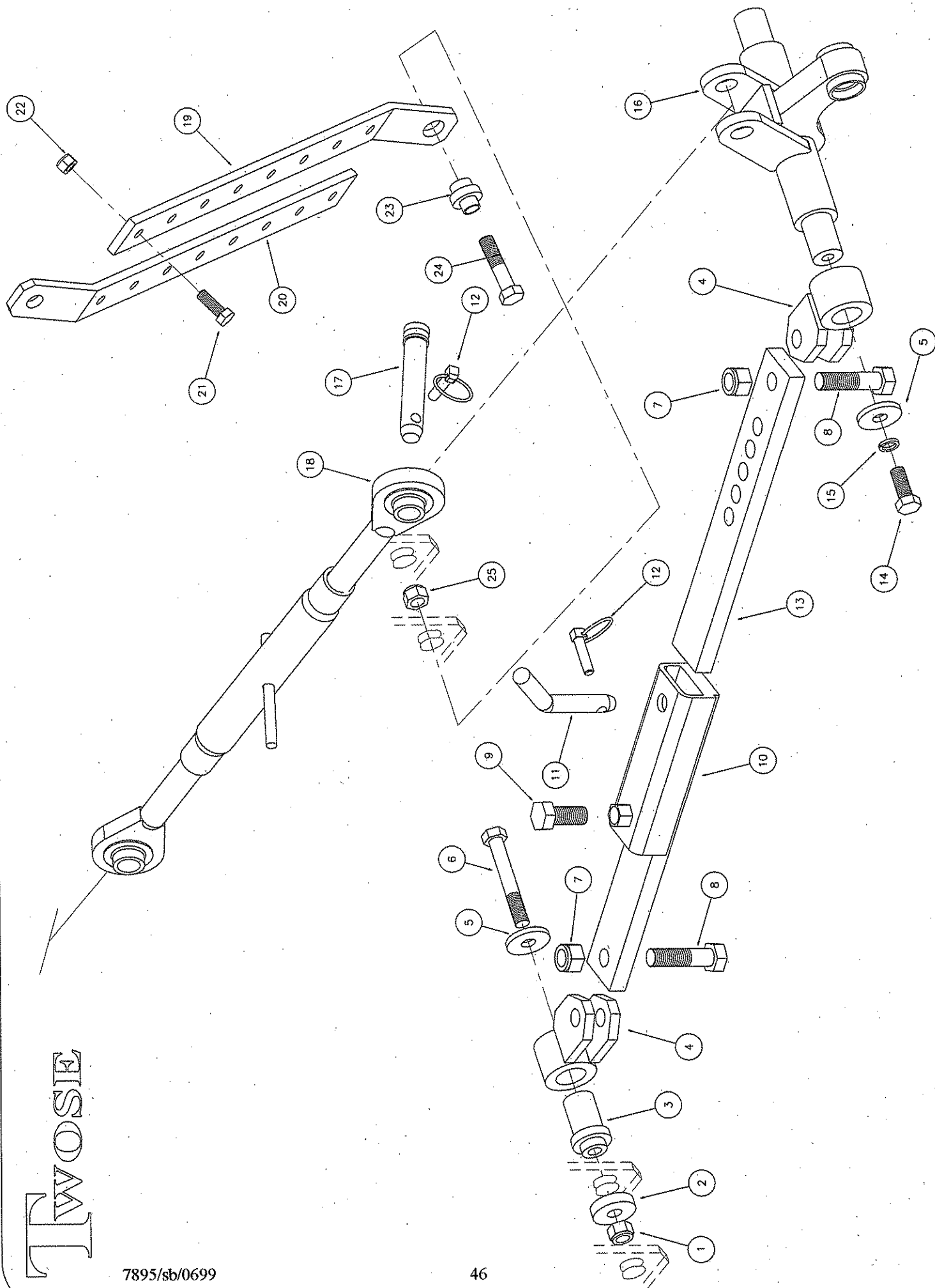


HEAD ANGLING PARTS.

1	6981	Bolt M 6 * 50 (8.8)	2
2	187.036	Pin, Ang. Ram Rod 20 Dia EN8 x 150 7xd	1
3	4776	Stiffnut M 6 Nyloc	2
4	187.026	First Banana	1
5	2700	Bolt M12 * 45 (8.8)	8
6	3082	Stiffnut M12 Nyloc	8
7	187.024	Head Bracket	1
8	2948	Setscrew M16 * 30 (8.8)	3
9	2730	Washer M16 Spring	3
10	184.526	Washer M16 Special 40 Dia BDMS x 5	2
11	2923	Grease Nipple M10	9
12	187.027	Second Banana	1
13	5178	Bush 3030m Nylon	3
14	6935	Bush PM 6040 DX	2
15	7802	Bush 2025M Nylon	2
16	187.028	Link Plate - Head pivot	1
17	185.096	Washer M16 Special 50 Dia BDMS x 6	1
18	187.034	Pin, Head Link Anc. 30 Dia EN8 x 121 20id	1
19	3124	Bush 3040M Nylon	2
20	3634	Bolt M20 *170 (8.8)	1
21	1780034	Ram Hydraulic	1
	1780034.1	Seal set for above	

Depending on model:

22	187.022A	Second Boom - 455	1
22	187.022B	Second Boom - 420	1
23	187.047	Pipe Clamp- Head Angling 25x6MS x 64	2
24	3182	Stiffnut M 8 Nyloc	2
25	187.035	Pin, Ang. Ram Anc. 20 Dia EN8 x 106 7xd	1

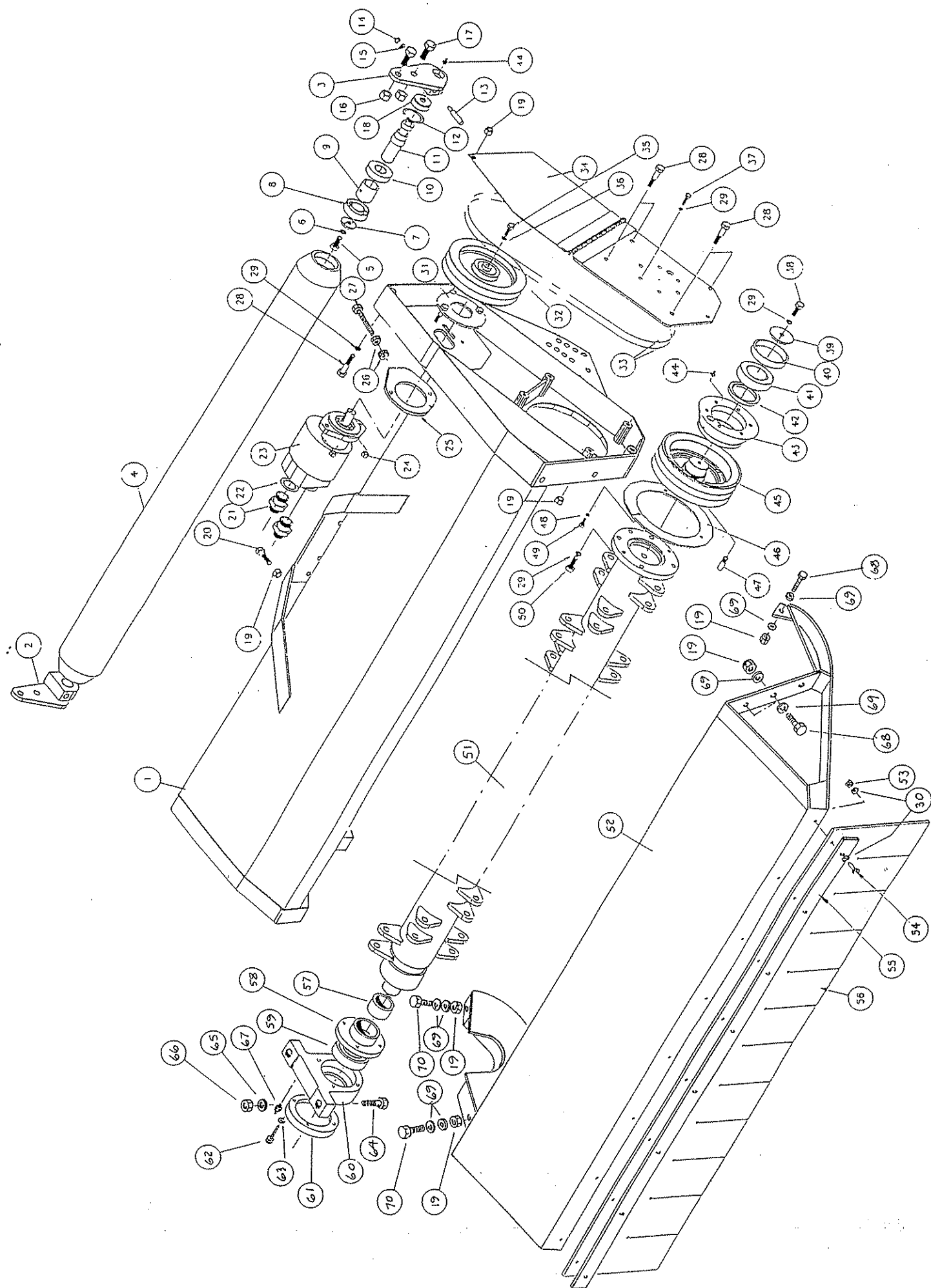


STABILISER PARTS.

1	3747	Stiffnut M16 Nyloc	2
2	184.436	Washer M16 Special 50 Dia BDMS x 12	2
3	187.053A	Lift Pin Stabiliser 45 Dia BDMS x 69	2
4	184.430	Anchor Bracket	4
5	185.096	Washer M16 Special 50 Dia BDMS x 6	4
6	2914	Bolt M16 *110 (8.8)	2
7	3732	Stiffnut M20 Nyloc	4
8	2705	Bolt M20 * 75 (8.8)	4
9	3904	Setscrew M20 * 45 (8.8)	2
10	184.672	Slide Box	2
11	184.437	Pin 20 Dia BDMS x 160	2
12	0832	Pin Linch 7/16"	3
13	184.671	Slide Arm Inner 60x20MS x 440	2
14	3904	Setscrew M20 * 45 (8.8)	2
15	2730	Washer M16 Spring	2
16	184.435A	Top Link Coupler (Wide)	1
or	184.435B	Top Link Coupler (Narrow)	1
17	2584	Pin Linkage 1"	1
18	7758	Top Link Assembly Cat2	1

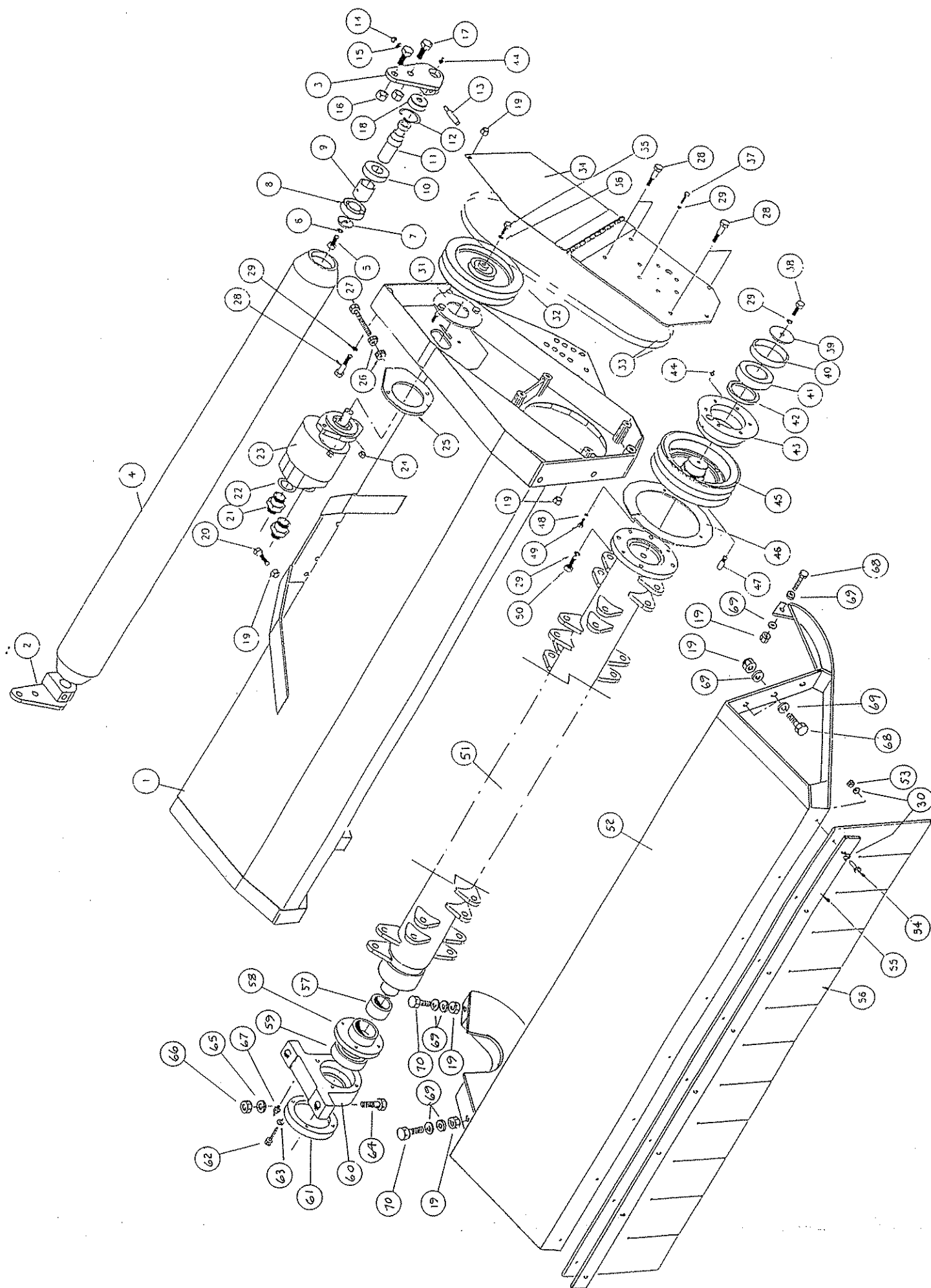
FOR DIRECT DRIVE MACHINES

19	192.033A	Stabiliser bar	2
20	192.033B	Stabiliser bar	2
21	2962	Setscrew M12 * 35(8.8)	4
22	3082	Stiffnut M12 Nyloc	4
23	192.034	Spacer 16id 35 Dia BDMS x 34 sh20/25	2
24	2871	Bolt M16 * 70(8.8)	2
25	3747	Stiffnut M16 Nyloc	2



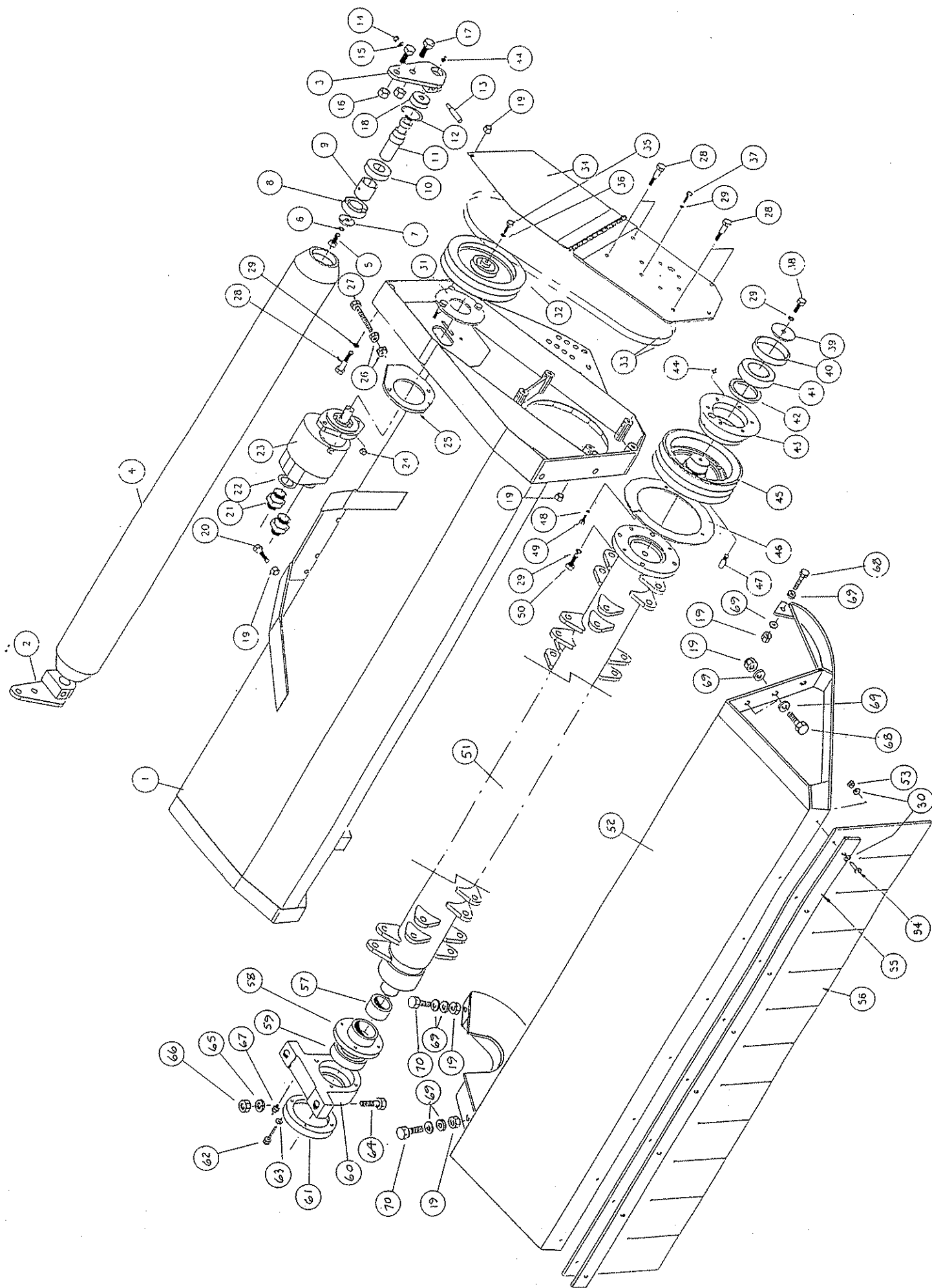
HEAD ASSEMBLY 1.2M AND 1.52M

<u>ITEM</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>
1	184.615A	Head 1.2m Weld Assy	1
or	184.615B	Head 1.52m Weld Assy	1
2	184.622R	Bracket Roller RH	1
3	184.622L	Bracket Roller LH	1
4	184.621A	Roller Assy 1.2m	1
or	184.621B	Roller Assy 1.52m	1
5	2711	Setscrew M12 x 20 (8.8)	2
6	2729	Washer M12 Spring	2
7	174.006	Washer M12 Special	2
8	8029	Bearing	2
9	184.589	Spacer	2
10	7898	Bearing	2
11	184.588	Shaft Stub Roller	2
12	8030	Circlip	2
13	1840591	Cotter Pin Special 1/8"	2
14	3182	Stiffnut M8 Nyloc	2
15	3111	Washer M8 Form A	2
16	3747	Stiffnut M16 Nyloc	4
17	2901	Setscrew M16 x 35 (8.8)	4
18	184.587	Spacer 30id	2
19	3082	Stiffnut M12 Nyloc	14
20	2733	Bolt M12 x 40 (8.8)	8
21	0935	Adapter 3/4 BSP	2
22	0934	Seal 3/4"	2
23	8027	Motor Gear Type for H/T	1
24	4421	Stiffnut M10 Nyloc	2
25	184.625	Motor plate assembly	1
26	2799	Fullnut M10	2
27	8172	Setscrew M10 x 80 (8.8)	1
28	2986	Bolt M12 X 80 (8.8)	6
29	2729	Washer M12 Spring	11
30	3111	Washer M8 Form 'A' for 1.2m Head	32
or	3111	Washer M8 Form 'A' for 1.52m Head	40
31	184.463	Motor Fixing Ring	1



HEAD ASSEMBLY
(1.2M AND 1.52M)
CONTINUED

<u>ITEM</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>
32	184.445	Pulley Motor 242 PCD	1
33	7692	Belt Vee	2
34	184.623	Drive Plate	1
35	7491	Bolt 3/8" UNF x 1"	1
36	0872	Washer Imp 3/8 Spring	1
37	2711	Setscrew M12 x 20 (8.8)	6
38	2950	Setscrew M12 x 30 (8.8)	4
39	184.461	Washer M12 Special	1
40	184.464	Spacer for Bearing	1
41	7840	Bearing	1
42	7790	Oil Seal	1
43	184.448	Bearing Housing	1
44	2923	G/Nipple M10 x 1.5	4
45	184.446	Pulley Rotor 200 PCD	1
46	184.636	Grass Ring	1
47	184.489	Dowel Pin	1
48	3001	Washer M8 Spring	3
49	2793	Setscrew M8 x 20 (8.8)	3
50	7855	Setscrew M12 x 35 FINE	4
51	184.618A	Rotor 1.2m Balanced - No flails, shackle type	1
or	184.618B	Rotor 1.52m Balanced - No flails, shackle type	1
or	184.619A	Rotor 1.2m Balanced - No flails, standard flails	1
or	184.619B	Rotor 1.52m Balanced - No flails, standard flails	1
or	184.620	Rotor 1.2m Rollicoupe Type	1
52	184.616A	Nose Weld Assy 1.2m	1
or	184.616B	Nose Weld Assy 1.52m	1
53	3182	Stiffnut M8 (for 1.2m head)	16
or	3182	Stiffnut M8 for (1.52m head)	20
54	2987	Setscrew M8 x 25 (8.8) (for 1.2m Head)	16
or	2987	Setscrew M8 x 25 (8.8) (for 1.52m Head)	20
55	184.617A	Clamp Strip for 1.2m Head	2
or	184.617B	Clamp Strip for 1.52m Head	2



HEAD ASSEMBLY
(1.2M AND 1.52M)
CONTINUED

<u>ITEM</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>
56	1840476F	Curtain for 1.2m Head	2
or	1840581	Curtain for 1.52m Head	2
57	192.046	Spacer for bearing	1
58	192.026	Shield for Bearing	1
59	7941	Bearing	1
60	192.024	Housing for bearing	1
61	192.025	Cap for Bearing	1
62	6985	Setscrew-Socket M6 x 45 Cap	4
63	2731	Washer Spring M6	4
64	2878	Bolt M16 x 55 (8.8)	2
65	3747	Washer M16 Form 'A'	4
66	2867	Stiffnut M16	2
67	6956	Grease Nipple M6	1
68	2950	Setscrew M12 x 30 (8.8)	3
69	3192	Washer M12 Form 'C'	10
70	2962	Setscrew M12 x 35	2

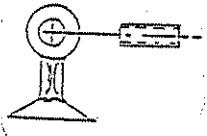
ROTOR AND FLAIL OPTIONS AVAILABLE

PARTS LIST FOR DS HEAD

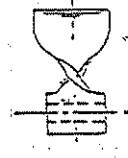
Flails, spacers, bolts and nuts:

184.619A | 184.619B

For 184.619A & B Rotors (A) -

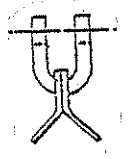
184.106	Spacer 16.5id 1" Dia EN8 x 40		24	30
1840093	Flail Heavy Duty		24	30
7942	Stiffnut M16 Nyloc		24	30
7943	Bolt M16 * 80 (10.9) Structural		24	30

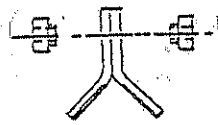
For 184.619A & B Rotors (C) -


184.106	Spacer 16.5id		24	30
1840330	Flail Grass Heavy Duty		24	30
7942	Stiffnut M16 Nyloc		24	30
7943	Bolt M16 * 80 (10.9) Structural		24	30

For 184.618 A & B Rotors (D) -

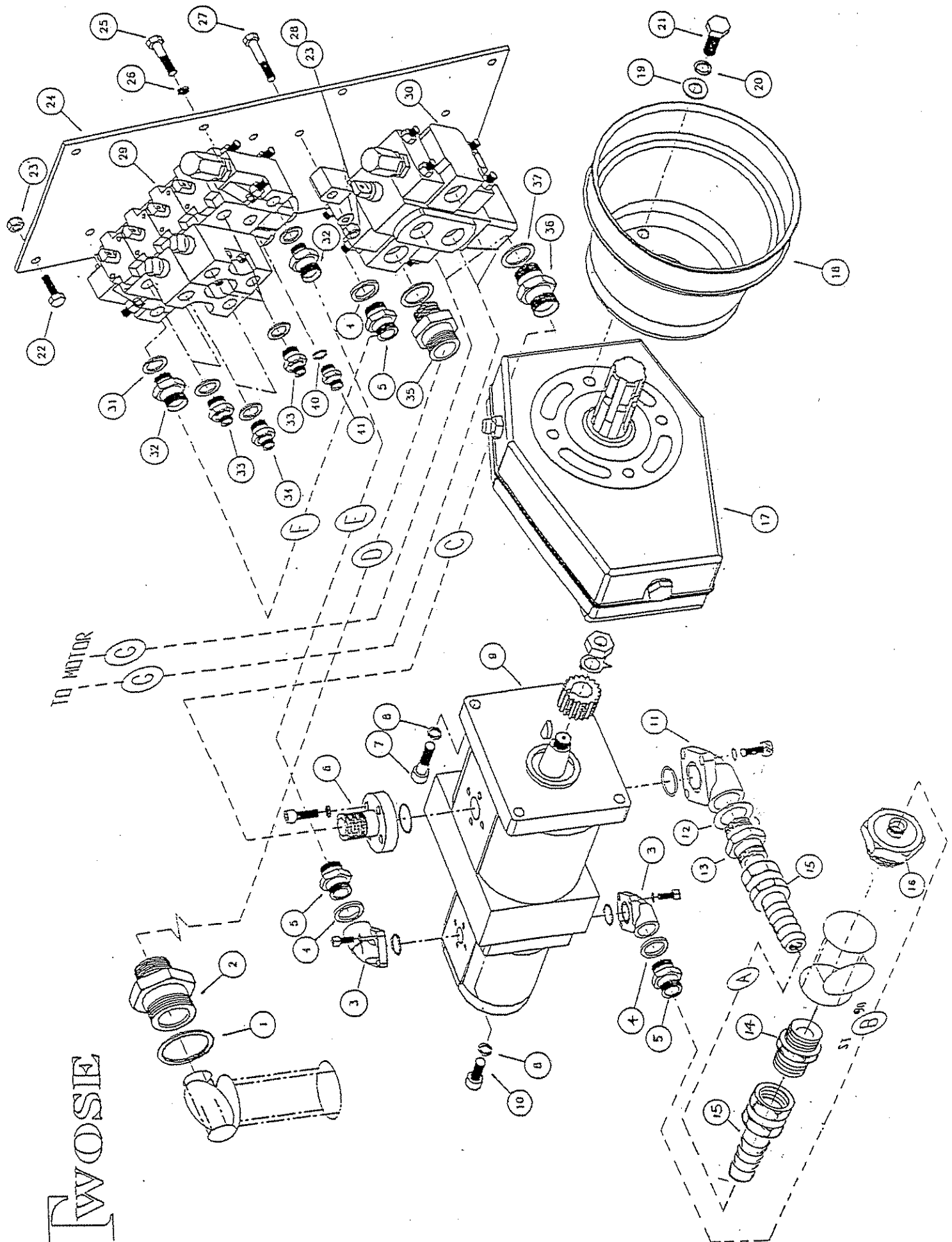
184.618A | 184.618B

1840455	Shackle for H/T Rotor		30	36
1840480	Blade for Shackle		60	72
7942	Stiffnut M16 Nyloc		30	36
7943	Bolt M16 * 80 (10.9) Structural		30	36
184.570	Spacer		30	36

For 184.619A & B Rotors	(E) -		184.619A	184.619B
184.500	Bush		48	60
	50 Dia EN8 x 20			
1840497	Back to back flail		48	60
7942	Stiffnut M16 Nyloc		24	30
7943	Bolt M16 * 80 (10.9)		24	30
	Structural			

For 184.618A & B Rotors	(F) -		184.618A	184.618B
1840455	Shackle		30	36
7943	Bolt M16 x 80 (10.9)		30	36
7942	Stiffnut M16 Nyloc		30	36
1840605	Boot Flail		30	36

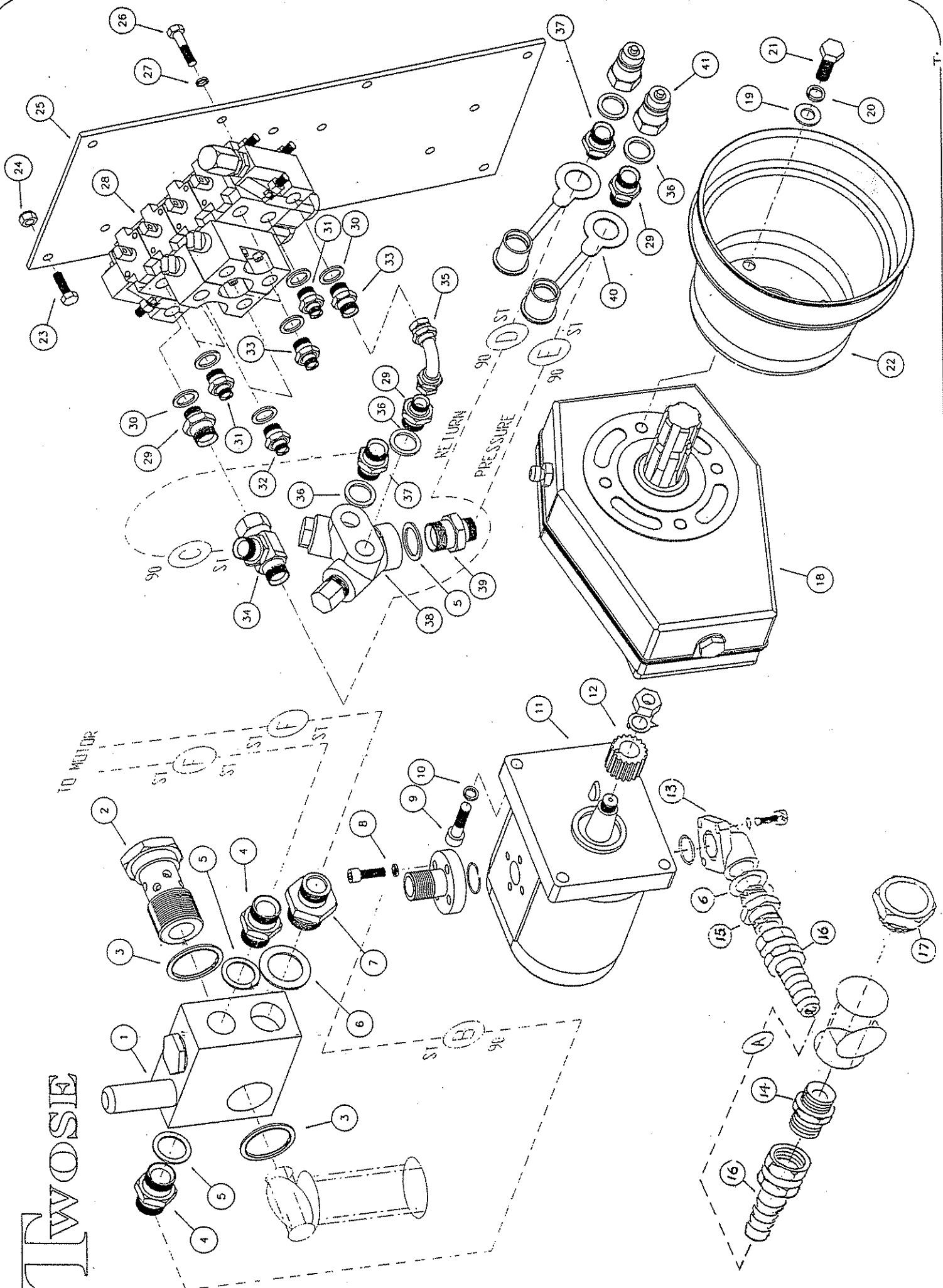
TWOSIE



PUMPS/GEARBOX/VALVE BLOCKS - FULLY INDEPENDENT HYD's.

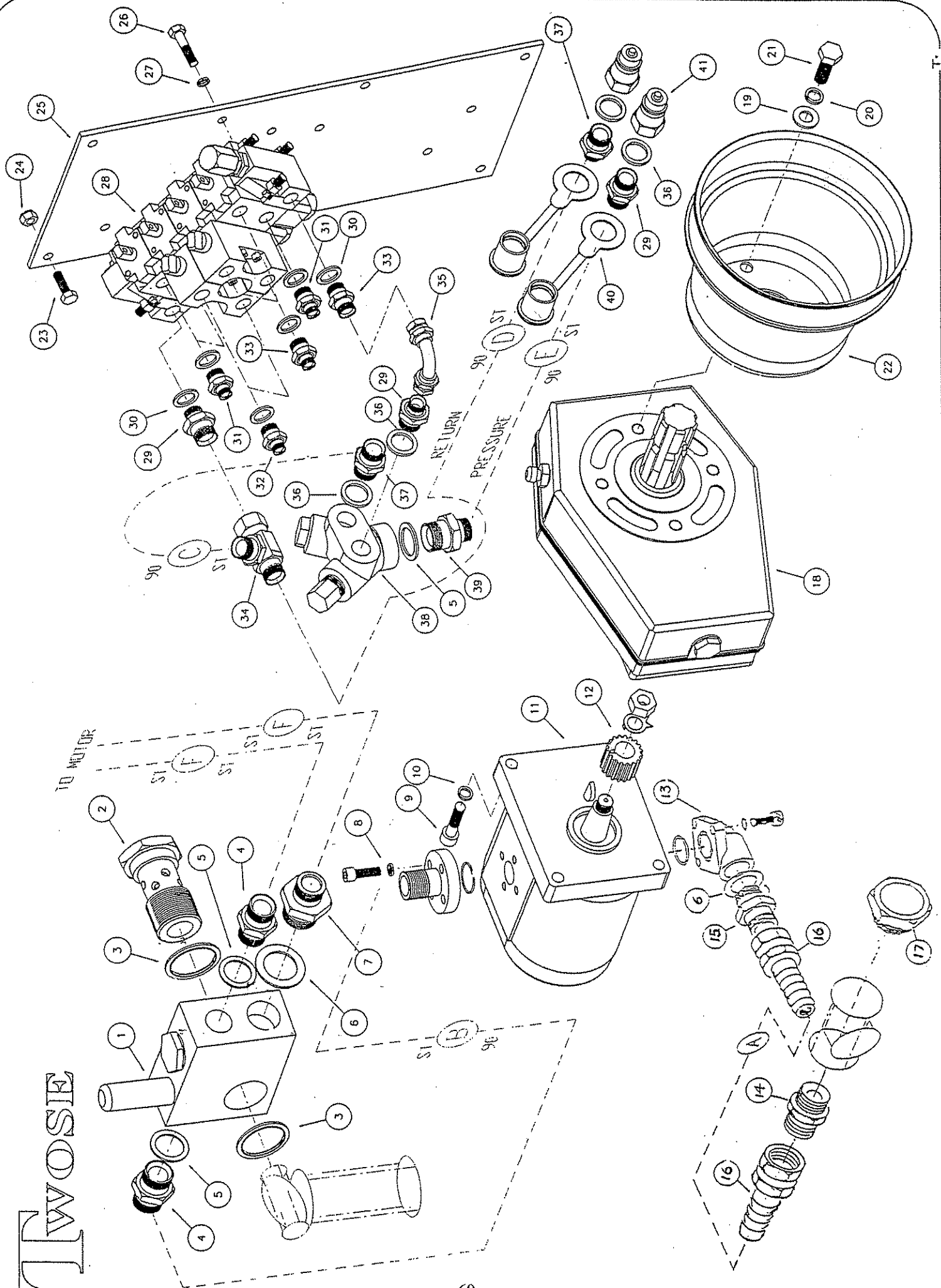
1	3155	Seal 1.1/4" Bonded	1
2	5241	Adaptor 1" x 1.1/4"	1
3	7939-E04	Elbow 1/2" 1PE4 c/w O Ring + 5/16" Screws	2
4	0909	Seal 1/2" Bonded	3
5	1826	Adaptor 1/2"	3
6	7939-E06S	Elbow 3/4" 1PE6 STRT+ O Ring + 5/16" Screws	1
7	5639	Setscrew M10 x 40 Cap Sock	4
8	2728	Washer M10 Spring	8
9	7939(41C.8.0)	Pumps Dual Only	1
10	5570	Setscrew M10 x 25 Cap Sock	4
11	7939-E08	Elbow 1" 1PE8 c/w O Ring + M10 Screws	1
12	1934	Seal 1" Bonded	1
13	8088	Adaptor 1" BSP X 1 1/2" BSP	1
14	7998	Adaptor 1 1/2" BSP x 1 1/2" BSPT	1
15	7999	Hose Tail 1 1/2" BSP x 1 1/2" hose	2
16	8010	Adaptor 3/4" BSP x 1 1/2" BSPT	1
17	8119	Gearbox 1:3.6 (HI-TON) LS2	1
18	6385	PTO Guard	1
19	2716	Washer M12 Form A	4
20	2729	Washer M12 Spring	4
21	2962	Setscrew M12 x 35 (8.8)	4
22	2987	Setscrew M 8 x 25 (8.8)	4
23	3182	Stiffnut M 8 Nyloc	7
24	187.054	Valve Plate 5MS x 460x 200	1
25	2793	Setscrew M8 x 20 (8.8)	4
26	3001	Washer M 8 Spring	4
27	3183	Bolt M 8 x 45 (8.8)	3
28	3111	Washer M 8 Form A	3
29	7893	Valve Block V1 (R117 bar)	1
30	7542	Valve Block V3 (R225 bar)	1
31	0670	Seal 3/8" Bonded	10
32	0914	Adaptor 3/8" x 1/2"	2
33	1180	Adaptor 1/4" x 3/8"	6
34	7739	Adaptor 1/4" x 3/8" Rest.=1mm	2
35	1836	Adaptor 3/4" x 1"	1
36	0935	Adaptor 3/4"	3
37	0934	Seal 3/4" Bonded	4
38	7551	Coupling GR3 Taper/1	1
40	1181	Seal 1/4" Dowty Bonded	1
41	1823	Adaptor 1/4" bsp	1
A	8000	Suction Hose x 0.9m	1
*	7455	Jubilee Clips for Suction Hose (8000)	4
B	004.451E	Hose 3/4 90 x 90 x 650 @ 120°	1
C	004.520E	Hose 3/4 90x90x 410 @180	1
D	004.327	Hose 1/2 STx90x 530	1
E	004.448E	Hose 1 90x90x 900 @090	1
F	004.400	Hose 1/2 STx90x 250	1
G	004.450	Hose 3/4 STxSTx 5950	2

TWOSE



PUMPS/GEARBOX/VALVE BLOCKS - SEMI INDEPENDENT HYD's.

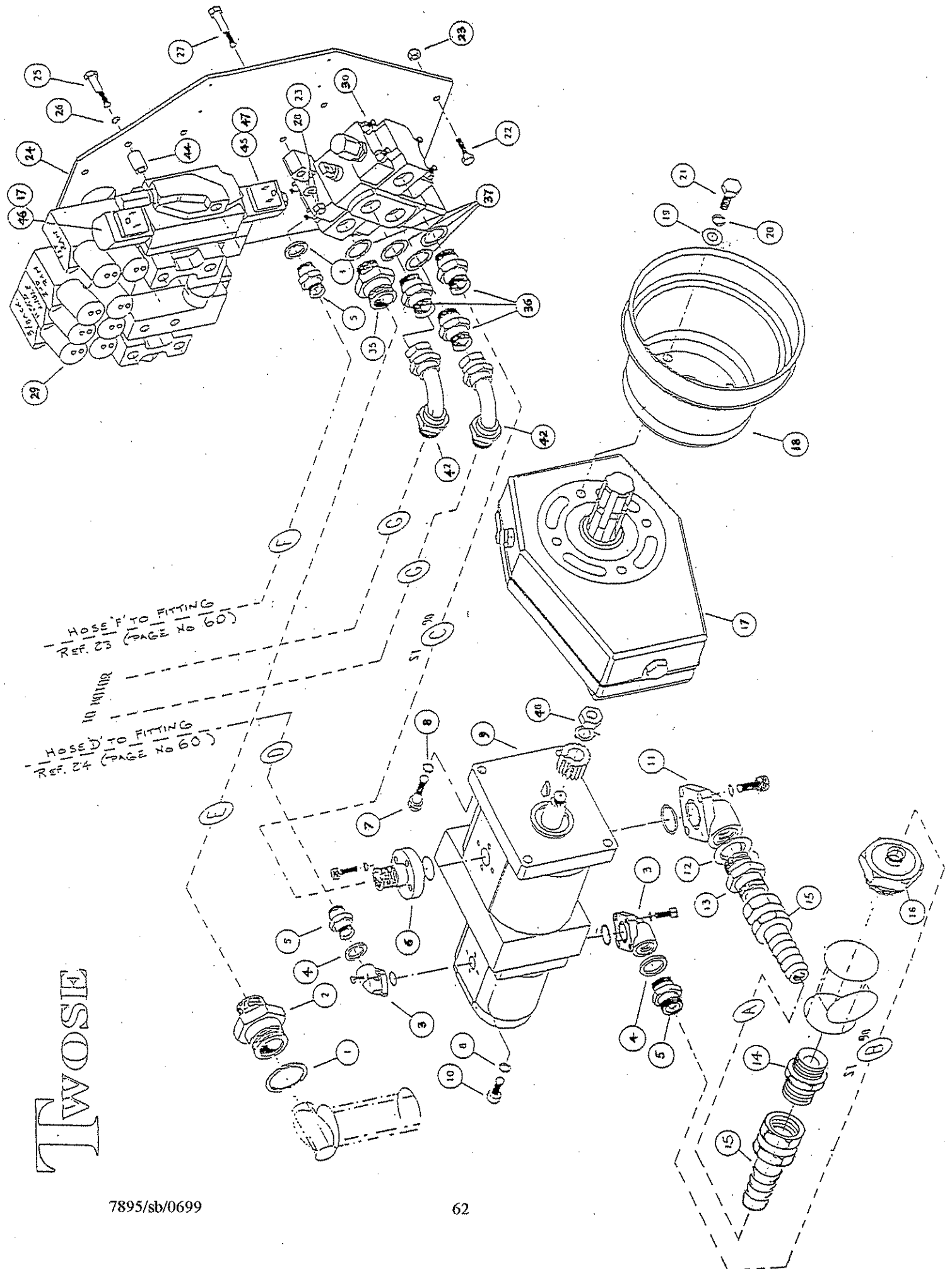
1	3154	Valve Relief/Anti-Cav.	1
2	071.418	Banjo Bolt 1.1/4"	1
3	3155	Seal 1.1/4" Bonded	2
4	0935	Adaptor 3/4"	2
5	0934	Seal 3/4" Bonded	3
6	1934	Seal 1" Bonded	2
7	1836	Adaptor 3/4" x 1"	1
8	7939-E06S	Elbow 3/4" 1PE6 STRT+ O Ring + 5/16" Screws	1
9	5639	Setscrew M10 x 40 Cap Sock	4
10	2728	Washer M10 Spring	4
11	7939(41C.0.0)	Pump Single Only	1
12	7551	Coupling GR3 Taper/1	1
13	7939-E08	Elbow 1" 1PE8 c/w O Ring + M10 Screws	1
14	7998	Adaptor 1 1/2" BSP x 1 1/2" BSPT	1
15	8088	Adaptor 1" BSP x 1 1/2" BSP	1
16	7999	Hose tail 1 1/2 BSP x 1 1/2" hose	2
17	7894	Plug 1.1/2"	1
18	8119 77556	Gearbox 1.3.6 (H-TON) LS2	1
19	2716	Washer M12 Form A	4
20	2729	Washer M12 Spring	4
21	2962	Setscrew M12 x 35 (8.8)	4
22	6385	PTO Guard	1
23	2987	Setscrew M 8 x 25 (8.8)	4
24	3182	Stiffnut M 8 Nyloc	4
25	187.054	Valve Plate 5MS x 460x 200	1
26	2793	Setscrew M 8 x 20 (8.8)	4
27	3001	Washer M 8 Spring	4
28	7893	Valve Block V1 (R117 bar)	1
29	0914	Adaptor 3/8" x 1/2"	3
30	0670	Seal 3/8" Bonded	10
31	1180	Adaptor 1/4" x 3/8"	6
32	7739	Adaptor 1/4" x 3/8" Rest.=1mm	2
33	0665	Adaptor 3/8"	1
34	5002	Tee 1/2 M-F-M	1
35	7819	Adaptor 3/8" F-FLN 90	1
36	0909	Seal 1/2" Bonded	2
37	1826	Adaptor 1/2"	2
38	7861	Valve Flow Control	1
39	1834	Adaptor 1/2 bsp x 3/4	1
40	5385	Dust Cap for QRC	2
41	5485	Coupling QRC Male 1/2"	2



PUMPS/GEARBOX/VALVE BLOCKS - SEMI INDEPENDENT HYD's
(CONT)

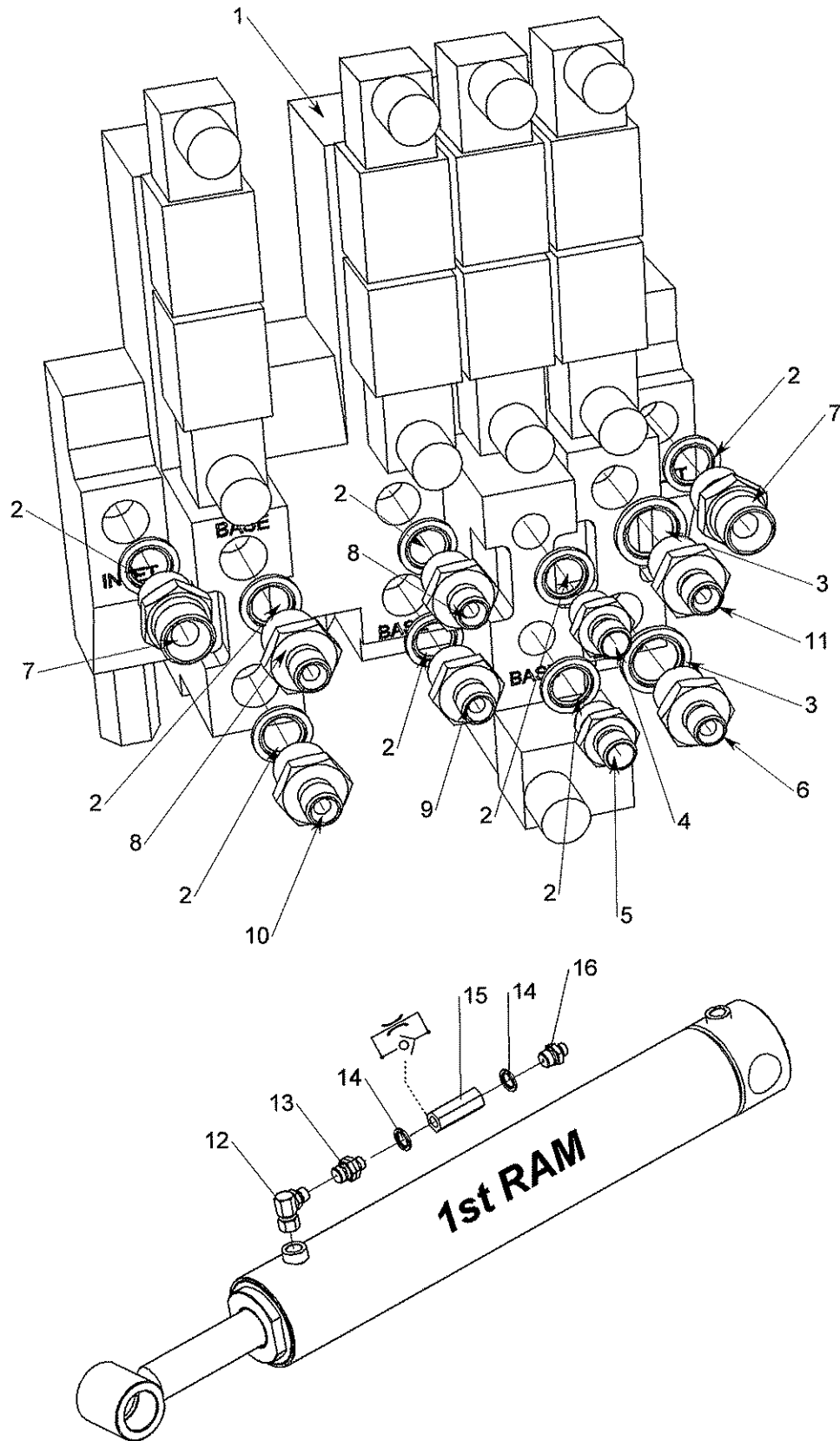
A	8000	Hose Suction x 0.9m	1
*	7455	Jubilee Clips for suction hose	4
B	004.513	Hose 3/4 STx90x 770	1
C	004.512	Hose 1/2 STx90x 450	1
D	004.511	Hose 1/2 STx90x 1250	1
E	004.330	Hose 3/8 STx90x 1250	1
F	004.450	Hose 3/4 STxSTx 5950	2

TWOSE



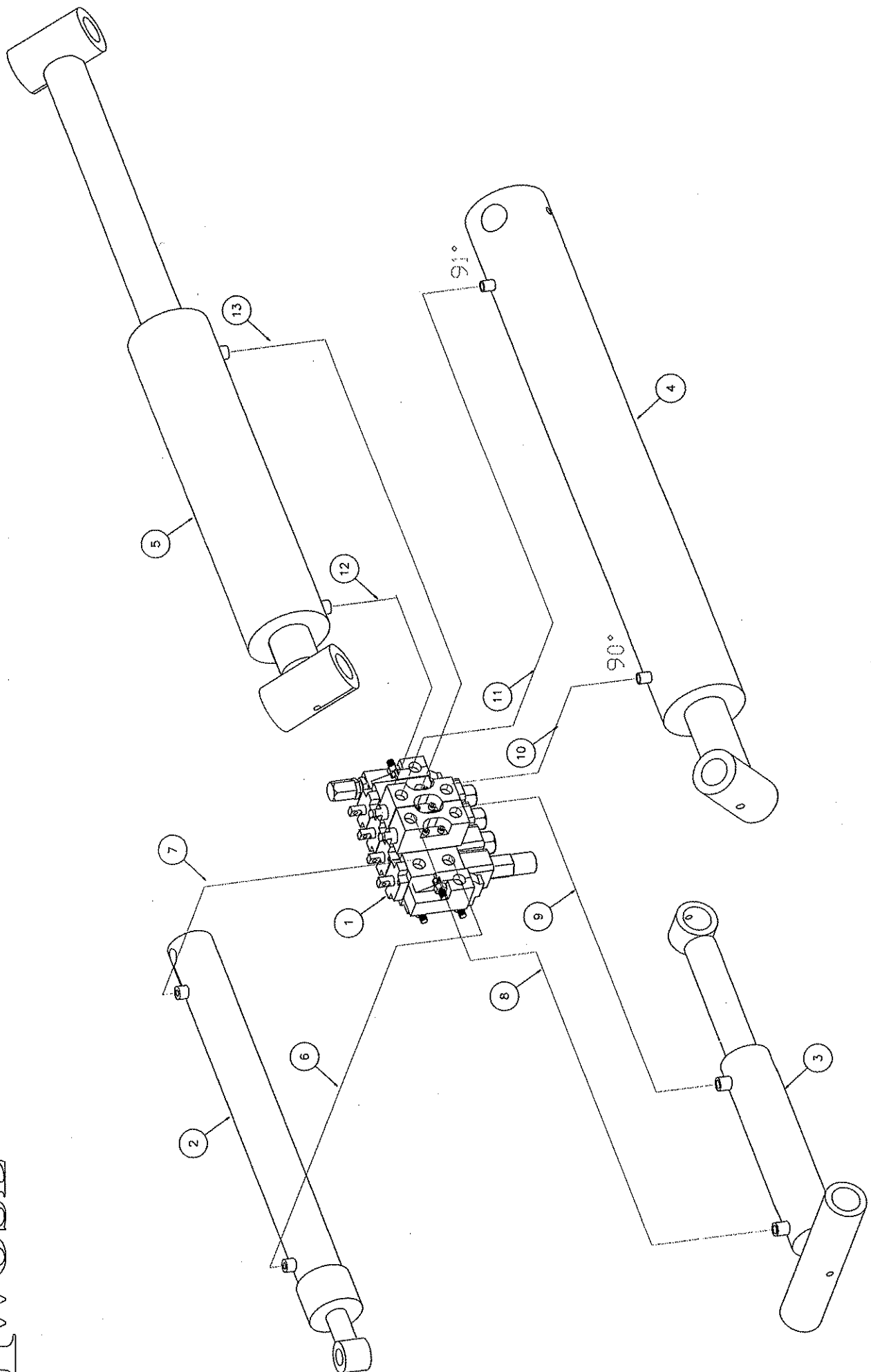
PUMPS/GEARBOX/VALVE BLOCKS - ELECTRIC MACHINES.

1	3155	Seal 1.1/4" Bonded	1
2	5241	Adaptor 1" x 1.1/4"	1
3	7939-E04	Elbow 1/2" 1PE4 c/w O Ring + 5/16" Screws	1
4	0909	Seal 1/2" Bonded	1
5	1826	Adaptor 1/2"	1
6	7939-E06S	Elbow 3/4" 1PE6 STRT+ O Ring + 5/16" Screws	1
7	5639	Setscrew M10 x 40 Cap Sock	4
8	2728	Washer M10 Spring	8
9	7939(41C.8.0)	Pumps Dual Only	1
10	5570	Setscrew M10 x 25 Cap Sock	4
11	7939-E08	Elbow 1" 1PE8 c/w O Ring + M10 Screws	1
12	1934	Seal 1" Bonded	1
13	8088	Adaptor 1" x 1 1/4" BSP	1
14	7998	Adaptor 1 1/2" BSP x 1 1/2" BSPT	1
15	8087	Hose tail, 1 1/4 BSP F/M x 1 1/4 hose	2
16	8010	Adaptor 3/4" x 1 1/4"	1
17	8119	Gearbox 1:3.6 (HI-TON) LS2	1
18	6385	PTO Guard	1
19	2716	Washer M12 Form A	4
20	2729	Washer M12 Spring	4
21	2962	Setscrew M12 x 35 (8.8)	4
22	2987	Setscrew M 8 x 25 (8.8)	4
23	3182	Stiffnut M 8 Nyloc	7
24	187.066	Valve Plate 5MS x 470x 358	1
25	3038	Bolt M 8 x 40 (8.8)	4
26	3001	Washer M 8 Spring	4
27	3183	Bolt M 8 x 45 (8.8)	3
28	3111	Washer M 8 Form A	3
29	7944B	Valve Solenoid V1000(Ref CV1076)Relief at 117 Bar	1
30	7542	Valve Block V3	1
35	1836	Adaptor 3/4" x 1"	1
36	0935	Adaptor 3/4"	4
37	0934	Seal 3/4" Bonded	5
42	3400	Adaptor 3/4 bsp x 3/4 90 Swept M-FLN	2
44	187.098	Spacer 16 DIA BDMS x 22 9id	4
45	7959	Cartridge Vickers DD (Prop) ERV1-10-25.00-0-00	1
46	7960	Cartridge Vickers DD (ON-OFF) SRV-10-C-0-00	1
47	7961	Coil Vickers 30577-12DG	2
48	7551	Coupling GR3 TAPER/1	1
49	7939-E06	Elbow 3/4" IPE 6 c/w o ring + 5/16" screws	1
*	7455	Jubilee Clips (for suction hose 8000)	4
A	8000	Hose x 0.9m (English)	1
or	8000	Hose x 0.9m (French)	1
B	004.451E	Hose 3/4" 90 x 90 x 650 @ 120° (English)	1
or	004.451F	Hose 3/4" ST x 90 x 850 (French)	1
C	004.520E	Hose 3/4 90x90x 410 @180	1
D	004.448E	Hose 1 90x90x 900 @090	1
E	004.512	Hose 1/2 STx90x 450	1
F	004.469F	Hose 1/2 STx90x 240	1
G	004.450	Hose 3/4 STxSTx5950	2



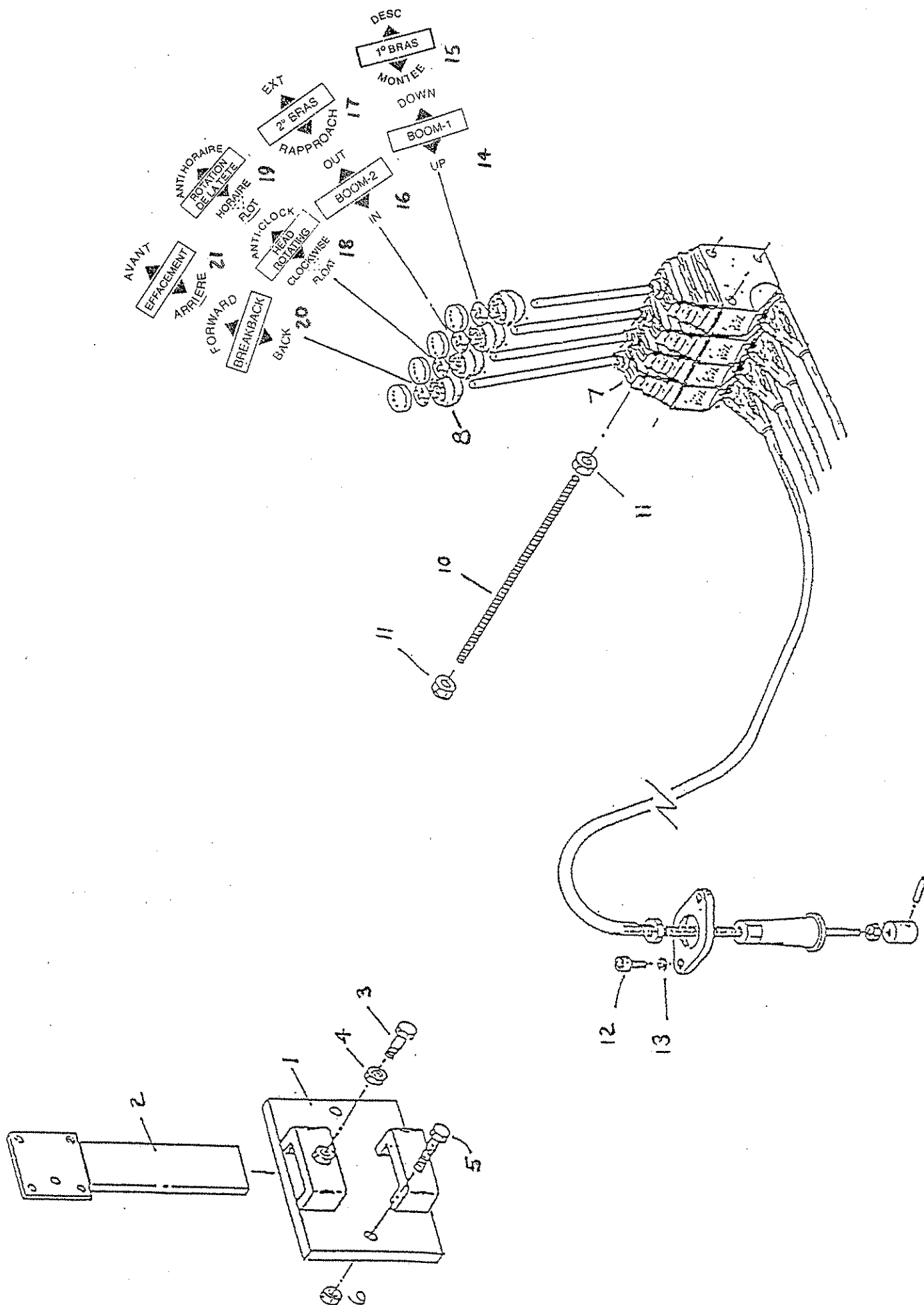
Model: 420 & 455	Edition: 7895-06-99 / 11-02	TWOSE
Component: VALVE ASSEMBLY - ELECTRIC		

1	1	8134250	Valve - Electric
2	8	8650103	Bonded Seal 3/8" BSP
3	2	8650104	Bonded Seal 1/2" BSP
4	1	8130066	Restrictor 1/4" x 3/8" BSP 1.15 M
5	1	8130048	Restrictor 1/4" x 3/8" BSP 1.3 C
6	1	8581172	Adaptor 1/4" x 1/2" BSP MM
7	2	8581110	Adaptor 1/2" x 1/2" BSP
8	2	8124093	Adaptor Restrictor 16 'A'
9	1	8124094	Adaptor Restrictor 1.8 'B'
10	1	8124096	Adaptor Restrictor 1.3 'D'
11	1	8124097	Adaptor Restrictor 1.15 'S'
12	1	6948	Adaptor 1/4" BSP M/FM 91
13	1	7305	Adaptor 1/4" M/FM
14	2	1181	Seal 1/4" BSP
15	1	8091	Restricted 1-way (1.1)
16	1	1823	Adaptor 1/4" x 1/4" BSP



HOSES - RAMS TO VALVE BLOCK.

1	7893	Valve Block V1	1
OR	7944	Valve Solenoid V1000	1
2	1780034	Head Angling Ram	1
3	1870033	Breakback Ram	1
4	1870031	Ram 1st	1
5	1870032	Ram 2nd	1
6	004.454E	Hose 1/4 90x91x5100 @270°	1
7	004.454E	Hose 1/4 90x91x5100 @270°	1
8	004.455	Hose 1/4 90x90x3700 @000	1
9	004.455	Hose 1/4 90x90x3700 @000	1
10	004.458A	Hose 1/4 STx90x 750	1
11	004.458B	Hose 1/4 90x91x750 @260°	1
12	004.457	Hose 1/4 90x91x1450 @045°	1
13	004.457	Hose 1/4 90x91x1450 @045°	1

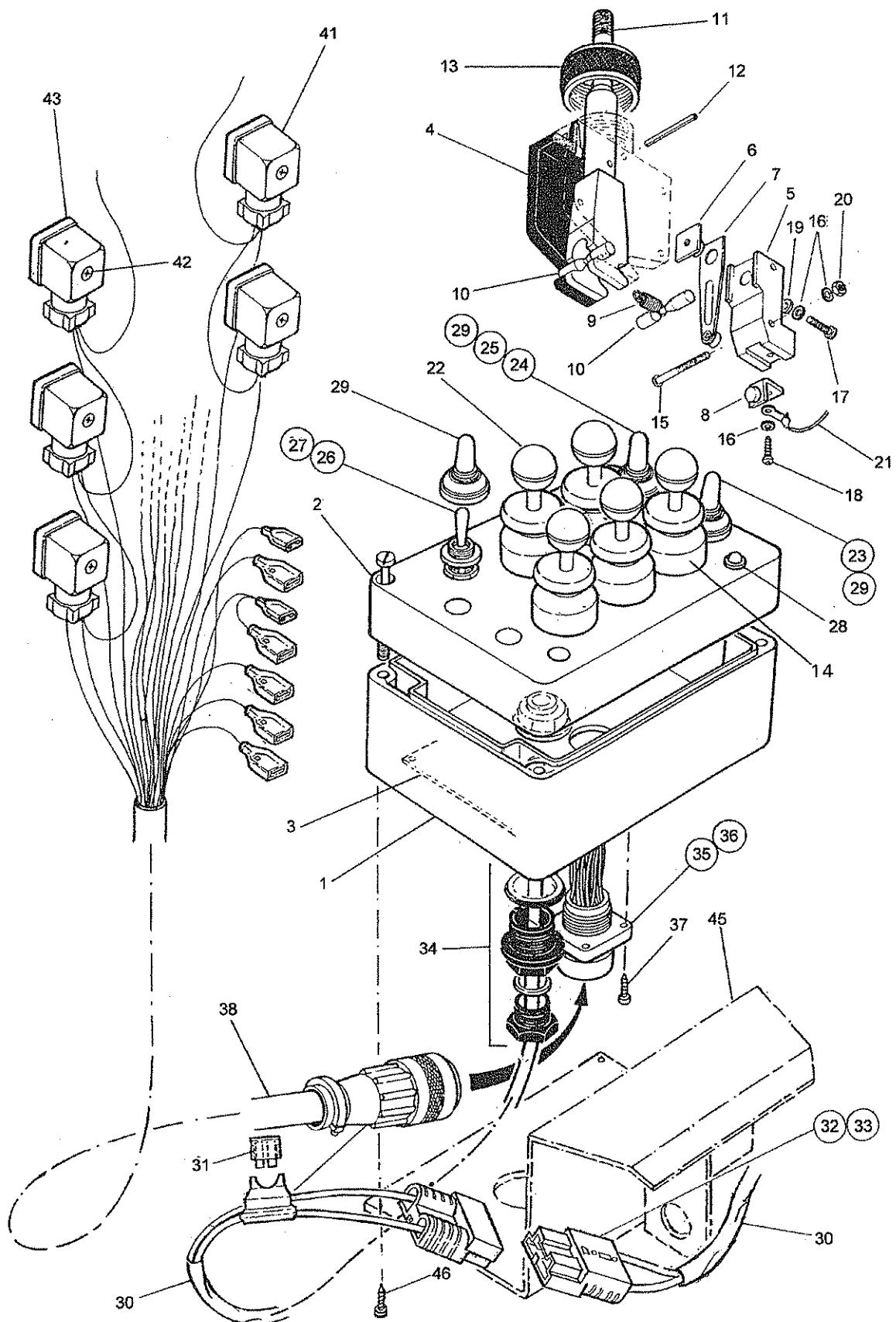


CONTROL LEVERS AND MOUNTING - 4 BANK CONTROLLERS.

1	184.257	Fixing Bkt - Controllers	1
2	184.258	Mounting Bracket Controller	1
3	2962	Setscrew M12 x 35 (8.8)	1
4	2721	Fullnut M12	1
5	3730	Setscrew M8 x 40 (8.8)	2
6	3182	Stiffnut M 8 Nyloc	2
7	7822	Cable Controller Assy	4
8	7835	Cable Cont Knob and Lens Black	4
10	184.259E	Studding M 6 * 235	3
11	4776	Stiffnut M 6 Nyloc	6
12	4695	Setscrew M 6 * 15 Cap Sock	8
13	2731	Washer M 6 Spring	8
14	1840373	Transfer "<-Boom 1->"	1
15	1840373F	Transfer "<-1~ Bras->"	1
16	1840374	Transfer "<-Boom 2->"	1
17	1840374F	Transfer "<-2~ Bras->"	1
18	1840501	Transfer "<-Head Rot->->Float"	1
19	1840501F	Transfer "<-Rot.Tete->-> Flot"	1
20	1840372	Transfer "<-Breakback->"	1
21	1840372F	Transfer "<-Effacement->"	1

CONTROL LEVERS AND MOUNTING - 5 BANK CONTROLLERS.

1	184.257	Fixing Bkt - Controllers	1
2	184.258	Mounting Bracket Controller	1
3	2962	Setscrew M12 x 35 (8.8)	1
4	2721	Fullnut M12	1
5	3730	Setscrew M8 x 40 (8.8)	2
6	3182	Stiffnut M 8 Nyloc	2
7	7822	Cable Controller Assy	4
8	7835	Cable Cont Knob and Lens Black	4
9	7836	Cable Cont Knob and Lens Red	1
10	184.259E	Studding M 6 * 235	3
11	4776	Stiffnut M 6 Nyloc	6
12	4695	Setscrew M 6 * 15 Cap Sock	10
13	2731	Washer M 6 Spring	10
14	1840373	Transfer "<-Boom 1->"	1
15	1840373F	Transfer "<-1~ Bras->"	1
16	1840374	Transfer "<-Boom 2->"	1
17	1840374F	Transfer "<-2~ Bras->"	1
18	1840501	Transfer "<-Head Rot->->Float"	1
19	1840501F	Transfer "<-Rot. Tete->-> Flot"	1
20	1840372	Transfer "<-Breakback->"	1
21	1840372F	Transfer "<-Effacement->"	1
22	1840371	Transfer "<-Rotor->"	1
23	1840371F	Transfer "<-Tete de Coupe->"	1
24	7823	Cable Cont Assy Baulk	1

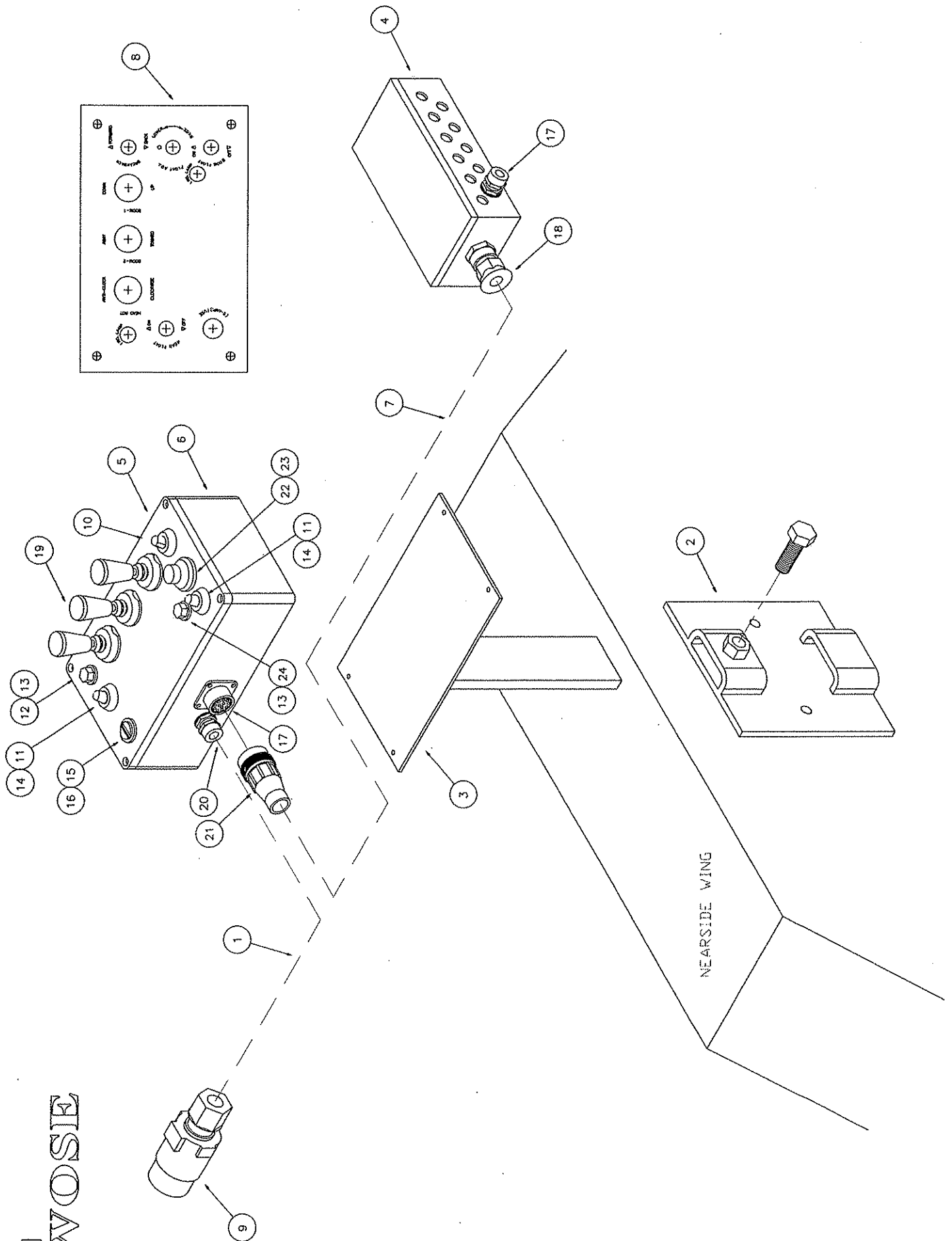


Model: 420 & 455	Edition: 7895-06-99 / 11-02	TWOSE
Component: SWITCHBOX CONTROLS & LOOM		

		41845.03	MULTI 5 LEVER SWITCHBOX
1	1	41845.32	Box
2	1	41845.31	Lid c/w Screws
3	1	41845.33	Circuit Board
	5	8402122	Lever Switch Unit - <i>comprising of:</i>
4	1	8402285	Switch Body
5	2	8402106	Contact Holder
6	2	8402109	Spring Contact Retainer
7	2	8402113	Spring Contact
8	2	8402108	Fixed Contact
9	1	8402101	Spring
10	2	8402111	Bar
11	1	8402256	Lever
12	1	0425320	Spring Dowel
13	1	8402051	Bezel Ring
14	1	8402022	Lever Gaiter
15	4	9200006	Screw - Posidrive Panhead
16	8	9100400	External Serrated Washer
17	2	9200005	Screw - Posidrive Panhead
18	2	8402119	Self-Tapping Screw
19	2	8402280	Plain Washer
20	2	9113000	Nut - Plated
21	5	41845.34	Loom - Lever Switch
22	5	8402056	Knob - Black
23	1	8402023	Switch - Power On/Off
24	1	8402182	Switch - Slew/Auto Reset
25	1	41845.35	Loom - Slew/Auto Reset Switch
26	1	8402197	Switch - Float
27	1	41845.37	Loom - Float Switch
28	1	41845.38	L.E.D. and Loom
29	3	8402024	Weather Gaiter
30	1	8402232	Power Loom - <i>including:</i>
31	1	43034.02	Fuse
32	2	8402230	Contacts Housing
33	4	8402229	Contacts
34	1	8402042	Gland
35	1	8402189	Socket Shell
36	17	8402192	Pin Socket
37	4	2800203	Screw
38	1	41844.03	Wiring Loom - <i>including:</i>
39	1	8402188	Shell
40	1	8402190	Cable Clamp
41	12	07.835.04	Plug - <i>including:</i>
42	1	07.835.03	Screw
43	1	07.835.02	Gasket
44	1	8402193	Special Tool
45	1	8402345	Mounting Bracket
46	4	2800243	Self-Tapping Screw

TWOSE

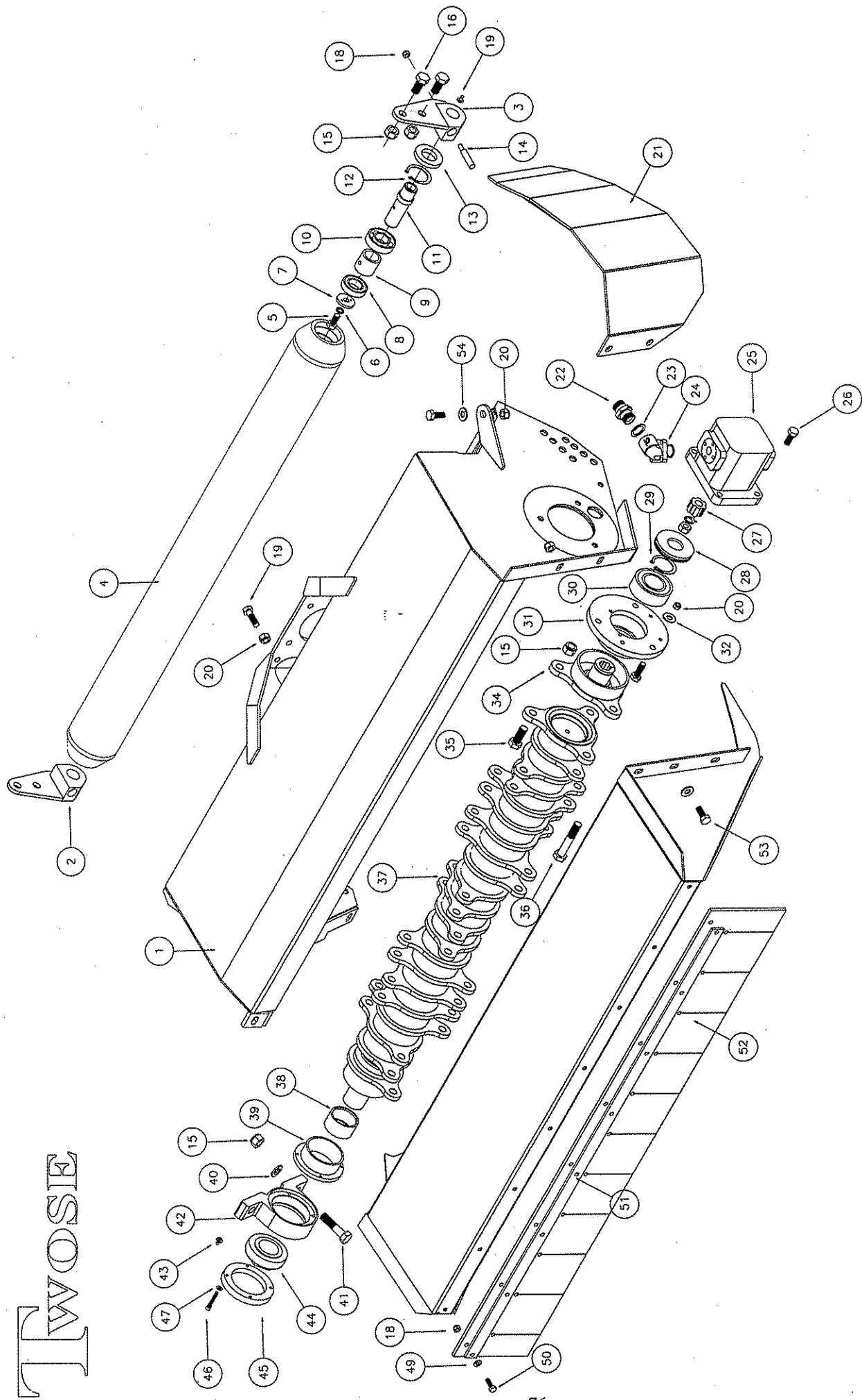
7895/sb/0699



ELECTRIC MACHINE WITH FULL FLOAT-CONTROL COMPONENTS.

1	184.194	Cable Twin x 1700 Lg	1
2	184.257	Fixing Bkt - Controllers	1
3	187.071	Control Box Support Brkt	1
4	187.097	Box. Modified 7629 (Boom powered float)	1
5	187.087	Lid for Control Box Boom powered float	1
6	187.074	Box Control	1
7	187.075	Cable 12 Core x 2600	1
**	187.082	Base for Control Box	1
**	187.083	Circuit Board	1
**	187.084	Cable 12 Core x 300	1
**	187.157	Circuit Board	1
8	1870086	Transfer Control Box Boom powered float	1
9	7211	Plug 7 Pin Electrical	1
10	7596	Switch for BBack 3 Way Autolec 0-496-00	1
11	7597	Switch for float RS 316-822	2
12	7598-R	Lampholder Red RS 564-958	1
13	7599	Bulb for 7598 RS 587-939	2
14	7602	Toggle Cover RS 316-967	2
15	7603	Fuseholder RS: 414-099	1
16	7634	Fuse 5 amp RS: 412-576	1
**	7637	Terminal Block 12 Way RS: 425-055	0.75
17	7638	Cable Gland RS: 544-011	13
18	7639	Cable Gland RS: 614-053	1
**	7640	Connector Crimp 0.25" RS: 534-339	2
**	7644	Fullnut M 3 RS: 527-230	8
**	7644	Fullnut M 3 RS: 527-230	4
**	7645	Setscrew M 3 * 6 RS: 523-828	2
**	7646	Setscrew M 3 * 20 RS: 523-840	8
**	7649	Terminal Block 12 Way RS: 425-077	0.16
**	7649	Terminal Block 12 Way RS: 425-077	0.16
**	7891	Bootlace Ferrule 12 C/C RS.458-689 (0.5)	13
**	7927	Setscrew M 3 * 12 RS: 523-834	4
19	7946	Joystick switch compact Ref No.S722001	3
20	7952	Cable Shell Socket RS 474-502	1
21	7953	Cable Shell Plug RS 474-883	1
**	7954	Insert Pins RS 466-797	12
**	7955	Insert Sockets RS 466-826	12
22	7588	Potentiometer 1Kohm RS 173-388	1
23	7593	Knob RS 509-973	1
24	7598-R	Lampholder Red RS 564-958	1

TWOSE

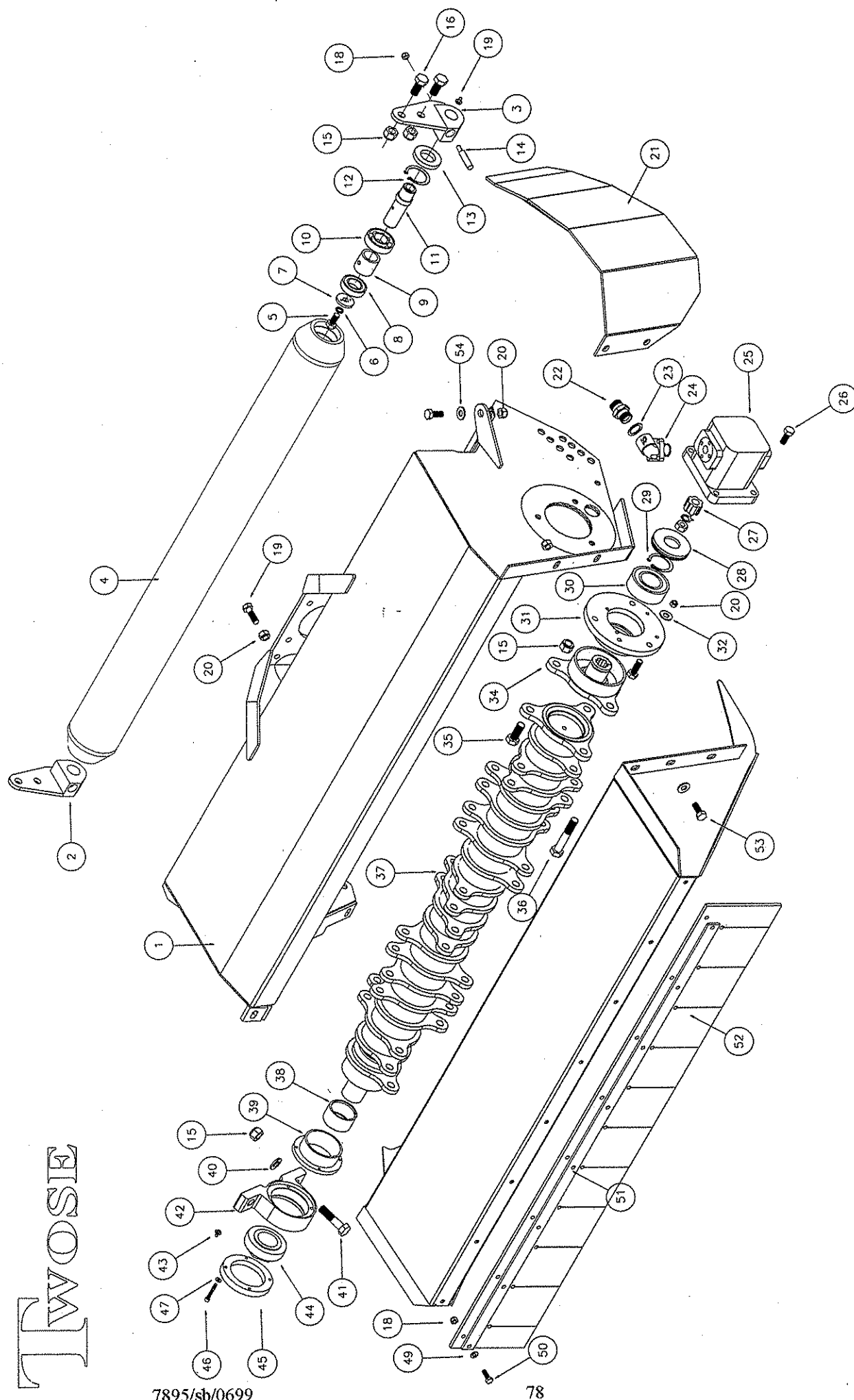


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HEAD ASSEMBLY 1.2M DIRECT DRIVE

<u>ITEM</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QTY</u>
1	184.626	Head 1.2m Weld Assy	1
2	184.622R	Bracket Roller RH	1
3	184.622L	Bracket Roller LH	1
4	184.621A	Roller Assy 1.2m	1
5	2711	Setscrew M12 x 20 (8.8)	2
6	2729	Washer M12 Spring	2
7	174.006	Washer M12 Special	2
8	8029	Bearing	2
9	184.589	Spacer	2
10	7898	Bearing	2
11	184.588	Shaft Stub Roller	2
12	8030	Circlip	2
13	184.587	Spacer 30id	2
14	1840591	Cotter Pin Special ⅜"	2
15	3747	Stiffnut M16 Nyloc	4
16	2901	Setscrew M16 x 35 (8.8)	4
17	2923	G/Nipple M10 x 1.5	2
18	3182	Stiffnut M8 Nyloc	2
19	2733	Bolt M12 x 40 (8.8)	8
20	3082	Stiffnut M12 Nyloc	14
21	184.627	Guard motor	1
22	0935	Adapter 3/4 BSP	2
23	0934	Seal 3/4"	2
24	7939-E06	Elbow ¾" 1PE6	2
25	8096	Motor Gear Type for H/T	1
26	3536	Setscrew M12 x 30 Cap socket	4
27	192.027B	Coupling Drive Male	1
28	192.042B	Collar Motor	1
29	8034	Circlip D1400-0450	1
30	8033	Bearing 3209B	1
31	192.041B	Housing for Bearing	1
32	2716	Washer M12 Form A	3
33	2962	Setscrew M12 x 35 (8.8)	2
34	192.044B	Flange Drive	1
35	2892	Setscrew M16 x 40 (8.8)	3
36	2872	Bolt M16 x 90 (8.8)	1
37	192.045B	Rotor 1.2m machined and balanced	1

TWOSE



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Note This rotor is suitable for the following flail options only:-
Heavy duty, double edged one piece (1840093)
Rigid, back to back (1840497)
Heavy duty single edge-twisted (1840330)
Boot flail, on shackle (1840605)+(1840455)

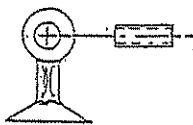
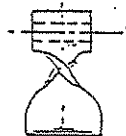
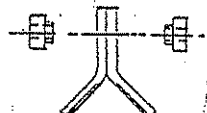


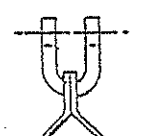
OR

37* 192.054B Rotor 1.2m machined 1
and balanced

Note This rotor is suitable for the following flail options only:-
Back to back on shackle (1920071)+(1920052)
Boot flail, on shackle (1840605)+(1920052)
See page 80 for Rotor details and full flail options.

38	192.046	Spacer for bearing	1
39	192.026	Shield for bearing	1
40	2867	Washer M16 Form A	4
41	2878	Bolt M16 x 55 (8.8)	2
42	192.024	Housing for bearing	1
43	6956	Grease nipple M6	1
44	7941	Bearing 1050-45KG c/w	1
		Adapter sleeve, washer and locknut.	
45	192.025	Cap for bearing	1
46	6985	Setscrew M6 X 45 cap	4
47	2731	Washer M6 Spring	4
48	184.616A	Nose 1.2m	1
49	3111	Washer M8 Form A	32
50	2987	Setscrew M8 x 25 (8.8)	16
51	184.617A	Clamp strip for 1.2m Head	2
52	1840476F	Curtain for 1.2m Head	2
53	2950	Setscrew M12 Nyloc	14
54	3192	Washer M12 Form C	10

FLAIL OPTIONS (INCLUDING FLAIL FITTING KIT) (1.2M HEAD)

<u>PART NO.</u>	<u>DESCRIPTION</u>		<u>QTY</u>
1840093	Flail. Heavy Duty		24
184.106	Spacer		24
7943	Bolt M16 x 80 (10.9) Fine-structural		24
7942	Stiffnut M16 Fine (Nyloc)		24
Note:-	Rotor 192.045B.100B Measures 1311.5 o/a length and 40mm between flail ears.		
----- *			
1840330	Flail H.D Twisted		24
184.106	Spacer		24
7943	Bolt M16 x 80 (10.9) Fine-structural		24
7942	Stiffnut M16 Fine (Nyloc)		24
Note:	Rotor 192.045B.100B Measures 1311.5 o/a length and 40mm between flail ears.		
----- *			
1840497	Flail, Rigid back-to-back		48
184.500	Bush		48
7943	Bolt M16 x 80 (10.9) Fine-structural		24
7942	Stiffnut M16 Fine (Nyloc)		24
Note:	Rotor 192.045B.100B Measures 1311.5 o/a length and 40mm between flail ears.		
----- *			
1840605	Boot flail		24
1840455	Shackle		24
7943	Bolt M16 x 80 (10.9) Fine-structural		24
7942	Stiffnut M16 Fine (Nyloc)		24
184.570	Spacer		24
Note:	Rotor 192.045B.100B Measures 1311.5 o/a length and 40mm between flail ears.		
----- *			
1840605	Boot flail		24
1920052	Shackle		24
1920069	Bolt M12 x 87 (10.9) Fine		24
8095	Stiffnut M12 Fine (Nyloc)		24
192.053	Spacer		24
Note:	Rotor 192.054B.100B Measures 1311.5 o/a length and 53mm between flail ears.		
----- *			
1920071	Flail, Back to back		48
1920052	Shackle		24
1920069	Bolt M12 x 87 (10.9) Fine		24
8095	Stiffnut M12 Fine (Nyloc)		24
192.053	Spacer		24
Note:	Rotor 192.054B.100B Measures 1311.5 o/a length and 53mm between flail ears.		